

**KAI REHDER, PETER SOUTHORN, ALAN SESSLER**

# **Art to Science**

**Department of Anesthesiology, Mayo Clinic**



Kai Rehder, Peter Southorn,  
Alan Sessler

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The department of anesthesiology of the Mayo Clinic celebrated its 75th anniversary at the millennium. To honor this occasion, members of the department of anesthesiology have written a history of the department and some of its subspecialties. The authors recognize that this book is not inclusive of the history of all sections of the department and does not reflect the total contributions made to the development of the specialty, department or the institution.

The picture on the front cover shows Drs. Charles Mayo and William Mayo operating in the first operating room of St. Marys Hospital. Dr. W. W. Mayo supervises the anesthetic given by Edith M. Graham. Sisters Joseph and Constantine are assisting the Mayo brothers (Archives St. Marys Hospital).

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**Department of Anesthesiology, Mayo Clinic**





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*Presidents of the ASA, President of American Society of Regional Anesthesia, Directors of the American Board of Anesthesiology, Presidents of the Minnesota Society of Anesthesiologists, President of the Florida Society of Anesthesiologists, ASA Distinguished Service Award, ASA Excellence in Research Award, Members of the Editorial Board of Anesthesiology, Members of the Editorial Board of Anesthesia and Analgesia, Named Professors—Mayo Foundation, Distinguished Clinician—Mayo Foundation, Chairpersons and Section/Department Designations, Mayo Clinic Rochester, Jacksonville, and Scottsdale, Administrators Assigned to Department in Rochester, Chairs of University Departments, Academic Ranks at the Mayo Clinic*

### Staff Biographies and Pictures

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1970, 1977, 1982, 1988, and 1998

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# Foreword



The Department of Anesthesiology at Mayo Clinic has always had a pioneering spirit. This spirit began with Dr. John Lundy, when he suggested an anesthesia specialty area to the Mayo brothers in the early 1920s. It continues today with a staff of skilled anesthesiologists, nurse anesthetists, and respiratory therapists in Mayo Clinic locations in Minnesota, Florida, and Arizona who use their collective talents to develop innovative techniques that improve the care of patients.

This department has set a standard of care that goes beyond the boundaries of Mayo Clinic to influence national and international anesthesiology practice. The anesthesiology residency, nurse anesthesia, and respiratory therapy training programs develop outstanding individuals for the Mayo practices as well as for practices in cities and towns worldwide. Through clinical and laboratory research, Mayo anesthesiologists and scientists have made advances in scientific knowledge and practice that have profoundly impacted the delivery of anesthesia care throughout the world.

This group of dedicated physicians, nurses, and many others strongly support Mayo Clinic's integrated medical practices. Their dedication to Mayo teamwork and to the precept that "the needs of the patient come first" has led them to contribute far more than Dr. John Lundy might have anticipated in 1924. Seventy-five years later, we can look back with pride at their accomplishments. Their successes in clinical practice, education, and research reflect the ideals to which all of us at Mayo ascribe.

Michael B. Wood, M.D.  
President and Chief Executive Officer  
Board of Trustees  
Mayo Foundation

July 27, 2000



# Preface

The Department of Anesthesiology at Mayo Clinic has a rich and robust history. It is fitting that this book is prepared to celebrate 75 years of the department's contributions to the Mayo Clinics' ideal of outstanding patient care in an integrated practice. Many members of the department have made significant contributions to the innovative practice of anesthesiology, critical care medicine, pain medicine and anesthesia research. It has been an honor for the physicians of the department, the nurse anesthetists, respiratory therapists, scientists, and others to participate and contribute to this growing legacy.

While many individuals deserve mention for their strong support of the development of this book, several were instrumental in its creation and should be recognized for their deep commitment to the project. Drs. Kai Rehder and Alan Sessler provided much of the impetus needed to initiate not only the book but also the compilation of materials. Dr. Rehder sifted through volumes of correspondence from Dr. Lundy and many other documents. Dr. Peter Southorn dedicated countless evenings and weekends to the coordination of chapter development. He integrated his outstanding editing skills with those of a professional editor, Dr. Marc Shampo, to produce an excellent historical tome. Importantly, Dr. Duane Rorie, chair of the department during the initiation of this book, generously provided the encouragement, support and resources required for its creation.

It is with great pride that the history of the Department of Anesthesiology at Mayo Clinic is presented. We are proud to recognize the many outstanding accomplishments of those individuals who have preceded us, and we are privileged to participate in this most respected Department.

Mark A. Warner, Chair  
Department of Anesthesiology

July 27, 2000



# Introduction

For many years, Mayo Clinic anesthesiology staff members and alumni have discussed writing a book on the history of the anesthesia department at the Mayo Clinic. At the urging of Dr. John T. Shepherd, Dr. Kai Rehder began planning such an undertaking and has continued the effort with the support of Dr. Duane K. Rorie and Dr. Mark A. Warner for much of the past year. As the work developed, the magnitude of the task became apparent, and Dr. Rehder enlisted the help of Dr. Peter A. Southorn, Dr. Alan D. Sessler, and others to prepare chapters covering the subspecialty areas and various activities of the department. This effort represents the first attempt to summarize the history of the department of anesthesiology at the Mayo Clinic. On balance, the anesthesia department has succeeded in acquiring the Mayo institution's midwestern work ethic and heritage and has managed to preserve its pioneering energy. It is teamwork oriented, more egalitarian than elite, more substantive than sophisticated, based more on merit and performance than on pedigree and, even in the presence of huge clinical workloads, has sustained throughout an academic mission that includes both teaching and research and spans the spectrum of inquiry from clinical studies to basic science.

Part of the motivation for collating this material has been the preoccupation with the new millennium and the fact that it is approximately 75 years since Dr. John S. Lundy started the section of regional anesthesia in 1924 and 110 years since Dr. W. W. Mayo administered the anesthetic for the first operation performed in St. Marys Hospital in 1889. A number of accounts have described the early beginning of anesthesia at the Mayo Clinic with its emphasis on nurses taught to administer ether for the large volume of surgical patients who had surgery between 1890 and 1920. Drs. Rehder and Southorn have reviewed this early material for the first chapter and also described the repeated efforts by the Drs. Mayo to introduce physicians to this practice. The Mayos saw the need for regional anesthesia and new anesthetic agents and techniques and were finally successful with the appointment of Dr. John S. Lundy in 1924. This appointment predates the introduction of academic anesthesia departments in a number of prestigious institutions across the country. A review of the archives on the early history of the Mayo Clinic, with the help of Dr. Carolyn S. Beck and colleagues in the Mayo Historical Unit, showed that they contain more material from Dr. Lundy's practice than for any other Mayo Clinic physician with the exception of Drs. Will and Charlie Mayo. Many of us who knew Dr. Lundy in his later and somewhat difficult years perhaps failed to appreciate the significant contributions he made to the department, the institution, and the specialty. Dr. John W. Pender has been steadfast in his defense of Dr. Lundy and his accomplishments, and a review of the archives confirms the correctness of that judgment. Dr. Lundy was head of the section from 1924 through 1952. He was followed by Dr. R. Charles Adams who worked in this capacity from 1952 to 1953. Dr. Adams' tenure was unfortunately relatively short because of his ill health. In preparing this book, we were fortunate in having his son Dr. Robert W. Adams share with us family scrapbooks detailing much of his father's life, including correspondence

with many of the leaders of the specialty at that time. Dr. Adams was succeeded by Dr. Albert Faulconer, Jr., who was chair from 1954 through 1970 and was arguably among the most talented physicians to have worked in the specialty. Dr. Faulconer oversaw the development of research and the beginnings of subspecialization during his time of leadership. He was succeeded by Dr. Richard A. Theye, who served as chairman from 1971 through 1976. Dr. Theye provided strong leadership both intramurally and extramurally. He conducted an NIH-funded research program and served as mentor for Drs. Michenfelder, Rehder, and others and introduced the first preoperative anesthesia clinic and the outpatient pain clinic before relinquishing his chairmanship prematurely owing to illness. Dr. Alan D. Sessler succeeded Dr. Theye and served from 1977 through 1988 as a manager and consensus builder during a period when anesthesiology enjoyed considerable growth as a specialty with the influx of increasing numbers of talented physicians. Dr. Sessler was succeeded by Dr. Roy Cucchiara, who was chairman from 1988 to 1991. Dr. Cucchiara motivated and mentored many residents to perform clinical projects in the operating rooms and moved rapidly to effect change in the department. Unfortunately, this change was divisive, and the leadership responsibilities were transferred to Dr. Duane K. Rorie in 1991 and remained with him until 1999. Dr. Rorie led the department through some difficult years, maintained and expanded the basic science laboratory efforts to their greatest level, and kept the department in synchrony with the institution during a phase of rapid growth in the clinical practice. In 1999, Dr. Mark A. Warner was appointed the new chairman of the department. He brings great energy and optimism to the task. Dr. Warner has been helpful and supportive of this project documenting the history of the department and addresses with enthusiasm the current challenges presented by the turmoil in health care.

The project has given us the opportunity for reflection, which we hope will benefit the department in the future. There is a paradox in that during a time of enlightenment, unprecedented prosperity and no major world conflict, we should enjoy the golden age in which health care, science, and education flourish. Why we do not realize this escapes us, but perhaps one needs to look no further than to the disruptive political machinations in health care. As one looks back on many persons who have been appointed consultants in the department, with a few outstanding exceptions, almost all of us have been relatively average physicians caught up in a medically exciting environment and motivated by the adventure of health care at a time of great discovery. We realize that many of the department's accomplishments and areas of activity remain to be documented. The authors have made a significant effort to ensure accuracy and inclusiveness. Where we have failed to meet your expectations, please let us know so that we can make corrections for future revisions and editions.

*Alan D. Sessler, Peter A. Southorn, and Kai Rehder*

# I. The Beginnings

(1820s to 1924)

## 1. Dr. William Worrall Mayo

The history of the development of the specialty of anesthesiology at the Mayo Clinic can be best understood with some background knowledge about the status of medical care in the Midwest during the 1800s. The first physician to come to Minnesota was Dr. Purcell, who arrived in 1820. About 10 years later, he was followed by Dr. Perup and in 1838 by Dr. Fitch. Dr. Purcell worked for the U.S. Army and Drs. Perup and Fitch were employees of the American Fur Company and the St. Croix Lumber Company.

By 1853, fewer than 20 physicians were practicing in the Minnesota Territory. That year, a new physician, Dr. Daniels, arrived by riverboat in St. Paul to become the U.S. Government surgeon for the Lower Sioux Agency. In 1854, he amputated an arm of La Framboise, the grandson of Chief Sleepy Eye, under chloroform anesthesia. This incident was the first documented use of a general anesthetic in the Minnesota Territory, and it occurred only 6 years after chloroform was introduced as an anesthetic agent.

In 1854, Dr. William Worrall Mayo (1819-1911), with his wife Louise and daughter Gertrude, moved from Lafayette, Indiana. The purpose of this relocation to Minnesota was to escape the attacks of malaria they had previously experienced in the summertime. Dr. W. W. Mayo became a medical officer for the U.S. Territorial Survey, and his wife opened a millinery shop. Two years after their arrival in Minnesota, they moved to Cronan's Precinct on the Minnesota River near Le Sueur. Here, Dr. Mayo started a medical practice and took up farming. Flooding in this precinct in 1859 convinced him to relocate to Le Sueur itself, where, with his brother James, he built a house for his family. His oldest son, William James Mayo (1861-1939), was born in this house on June 29, 1861.

During an uprising by the Sioux Indians in 1862, the town of New Ulm, Minnesota, was threatened by imminent attack. Drs. W. W. Mayo, Ayer, and Daniels accompanied the soldiers sent to defend that town. The Sioux Indians were defeated and were condemned to death by hang-

ing. Dr. W. W. Mayo saved the body of one of those hanged, Chief Cut Nose, the second in command to Chief Little Crow. Subsequently, Dr. Mayo prepared the skeleton of the chief and used it to teach anatomy to his two sons.

In 1863, Dr. W. W. Mayo was named the examining surgeon to the enrollment board for the First Minnesota District, which comprised the entire southern half of the state. This appointment, which was based in Rochester, was to conduct physical examinations of Union draftees for the U. S. Civil War (1861 - 1865). A year later, Dr. W. W. Mayo built a small cottage on Franklin Street and his family joined him in Rochester. In this cottage, his second son, Charles Horace Mayo (1865-1939), was born on July 19, 1865.

Although Dr. W. W. Mayo worked mostly as a general practitioner, he soon also achieved a reputation for being a competent surgeon. According to the oldest son, Dr. Will Mayo, his father generally preferred chloroform to ether for anesthesia. Dr. Charlie Mayo recounted that, when he was a boy, he often used to observe his father perform surgery with his older brother assisting. When he was only 12 years old, Charlie recalled, that on one such occasion the physician administering the anesthetic became sick. Charlie continued administering the anesthetic for the patient under the supervision of his father.

## 2. The Building of St. Marys Hospital

In the 1800s, the Right Reverend John J. Ireland suggested to the Sisters of St. Francis that their order erect a hospital in Rochester. When the city was hit by a severe tornado in 1883, Dr. W. W. Mayo was put in charge of medical relief by the City Council. In this work, he was helped by Dr. Will, who had graduated from the University of Michigan (Ann Arbor) that year and had joined his father's practice and also by Charlie, yet to begin his medical education. Dr. W. W. Mayo requested that the sisters help with the care of the injured citizens of Rochester, and they readily agreed to do this. At the time, Mother Alfred recalled the suggestion of Reverend Ireland and began planning for a hos-

pital in Rochester. Mother Alfred asked Dr. W. W. Mayo to head up the medical staff of this proposed hospital, St. Marys Hospital, which was opened for patients in 1889.

In 1888, Dr. Charlie graduated from Northwestern University (Evanston, Illinois) and joined the practice of his father. Charlie had been interested in anesthetics since early childhood. He, his brother, or the referring physician usually gave the anesthetic for operations performed by his father, before the opening of St. Marys Hospital.

Dr. Charlie was only 24 years old when he performed the first operation at the newly opened hospital. This procedure was to enucleate a patient's cancerous eye. His brother assisted him in the operation and his father administered the anesthetic. It is not known what anesthetic was used on that occasion.

At that time, techniques for administering anesthesia were extremely crude by modern standards. Usually, the administration consisted of soaking a cloth in either chloroform or ether and then tightly holding the cloth over the patient's mouth and nose. Patients subjected to this found it terrifying, not the least because it suffocated them. To avoid this feeling of suffocation, the three Mayos adopted a modification, the so-called open-drop method, in which the anesthetic was administered drop by drop onto sever-

al layers of gauze laid over a mask made of wire netting. This approach allowed the patient to breathe without obstruction. Their adoption of this open-drop technique preceded that of the learned medical centers on the East Coast of the United States. In fact, they had learned about it from a Dr. James Moore of Minneapolis, who had seen its use with chloroform in Berlin, Germany, in 1885. Dr. Moore was so impressed with this technique that he had brought with him the person who administered the chloroform to teach the technique to his friends, which included the three Mayos. This open-drop technique used to administer ether became the Mayos' favorite method of giving anesthesia.

### 3. Edith M. Graham

Dinah F. Graham (1860-1947) was the first graduate nurse to give an anesthetic at St. Marys Hospital while working under the supervision of Dr. Augustus W. Stinchfield (1842-1917), the first medical partner of the Mayo brothers. Her work in this field was short lived, and she was soon replaced by her younger sister, Edith M. Graham (1871-1943) (Fig. 1), who was trained to give anesthetics by Dr. W. W. Mayo. During the training of Edith Graham, Dr. W. W. Mayo stayed in the operating room assisting her until he was comfortable that she could administer an anesthetic safely by herself (Fig. 2).

The motive for Dr. W. W. Mayo training Edith Graham as an anesthetist was three-fold. Firstly, he was more than 70 years of age and wanted more time to travel and enjoy his hobbies while his sons carried on the surgical work in the hospital. Secondly, and more important but related



Fig. 1. Edith M. Graham was the second nurse anesthetist at the Mayo Clinic. The first nurse anesthetist was her sister Dinah F. Graham. Edith Graham served for 4 years. After she resigned, she married Dr. Charles H. Mayo. This statue of Edith Graham is located at St. Marys Hospital in Rochester, Minnesota.



Fig. 2. Edith Graham administering an anesthetic under the supervision of Dr. W. W. Mayo in the first operating room of St. Marys Hospital. Dr. Will (right) and Dr. Charlie (left) are performing the surgical operation. Sisters Joseph and Constantine are assisting as nurses.

to this desire, the Mayo brothers had no interns and they needed to find someone who could conscientiously and skillfully administer the anesthetic while they did the surgery. Finally, they also appreciated that physicians would be more interested in learning how to perform the surgical procedure than administering the anesthetic. Thus, the Mayos elected to use the services of Edith Graham and they subsequently employed other nurse anesthetists. To allay patient anxiety, they also elected to have the anesthetic inductions performed in the operating room in their presence, rather than utilize separate anesthetic induction rooms.

Edith Graham, a Rochester native, had studied at the Women's Hospital in Chicago, Illinois, for 18 months and was the first trained nurse in town when she was recruited by the Mayos in 1889. Her task was to teach the Sisters of St. Francis the rudiments of nursing, but after a few weeks, she began giving anesthetics. She was the sole anesthetist working for the Mayos until 1893, the year she married Dr. Charlie. During 1893, the Mayo brothers performed 495 surgical operations (Table 1). Alice Magaw, a friend of Edith Graham, was appointed as her replacement after the marriage of Edith Graham. Interestingly, both Dinah and Edith Graham were employed by St. Marys Hospital and not by the Mayo brothers.

#### 4. Alice Magaw

Alice Magaw (1860-1928) came to Rochester in 1893 (Fig. 3). She had been trained in nursing at the Women's Hospital in Chicago and had been taught anesthesia by Edith Graham. Alice

Magaw became particularly skilled as an anesthetist. Dr. Charlie used to fondly refer to her as the "Mother of Anesthesia." Alice Magaw appreciated early on the importance of gaining the patient's confidence before inducing anesthesia. In one of the five papers published by her she wrote:

Suggestion is a great aid in producing a comfortable narcosis. The anesthetist must be able to inspire confidence in the patient, and a great deal depends on the manner of approach. One must be quick to notice the temperament, and decide which mode of suggestion will be the most effective in the particular case; the abrupt, crude, and very firm, or the reasonable, sensible, and natural.

Reporting her "Observations on 1092 cases of anesthesia from Jan. 1 to Dec. 31, 1900," she concluded that:

Ether kills slowly, giving plenty of warning, while with chloroform there is not even time to say good-bye.

In 1904, Miss Magaw accepted an invitation to address the Minnesota State Medical Association and review what she had learned in giving 11,000 anesthetics. After her talk, her skill and knowledge were praised by the Mayo's friend, Dr. Moore, from Minneapolis. According to Helen Clapesattle in her book *The Doctors Mayo*, Dr. Moore noted in the discussion of the paper that chloroform was much faster in its onset of action. To this comment she reputedly answered:

The surgeon's time may be precious, but the patient's life is more so.

This remark by Miss Magaw was not found in the printed version of the discussion following the published report.

In 1906, Alice Magaw reported on her experience in administering more than 14,000 anesthetics, without a death directly attributable to the anesthetic! She had experimented with

Table 1.

Table 1. Operations Performed at Mayo Clinic from 1889 - 1924\*

Year	Operations	Year	Operations
1889-1892	655	1908	6,454
1893	495	1909	7,204
1894	530	1910	8,251
1895	751	1911	8,823
1896	877	1912	9,168
1897	915	1913	10,873
1898	1,100	1914	11,933
1899	1,616	1915	14,951
1900	1,823	1916	17,085
1901	2,126	1917	16,969
1902	2,420	1918	18,744
1903	2,640	1919	23,622
1904	3,131	1920	22,700
1905	3,836	1921	22,016
1906	4,770	1922	23,157
1907	5,523	1923	23,306
		1924	23,628

\* (From *Sketch of The History of the Mayo Clinic and the Mayo Foundation*, Division of Publications, Mayo Clinic, W. B. Saunders Company, 1926)



Fig. 3. Alice Magaw (Kessler) was trained by Edith Graham as nurse anesthetist. Dr. Charlie called her affectionately the *Mother of Anesthesia*. During her career, she published five papers on anesthesia.

nitrous oxide, scopolamine, morphine, and chloroform, but had always returned to using the open-drop ether method. Based on Magaw's experience, ether would remain the anesthetic of choice at the Mayo Clinic and its hospitals until 1920.

## 5. Dr. Isabella C. Herb

In the first few years after St. Marys Hospital was opened, the Mayo brothers assisted each other during surgery and Alice Magaw provided the anesthetics. By 1893, the volume of surgery had increased to such an extent the Mayos decided that they each had to have an operating room of their own (Table 2). To accomplish this, and specifically to give the anesthetics for Dr. C. H. Mayo and also fulfill a need for a tissue pathologist, they recruited in 1899 Dr. Isabella Coler Herb (year of birth either 1863 or 1864-1943) (Fig. 4). Dr. Herb had graduated from Northwestern University Women's Medical School in Chicago and was recommended for her anesthesia skills by Dr. Albert Ochsner, who was chief of surgery at Augustana Hospital in Chicago, Illinois. Before she came to Rochester, Dr. Herb had given more than 1,000 anesthetics. In addition to being the first physician anesthetist employed by the Mayo brothers at the Mayo Clinic, she became one of the first female physicians to be associated with the Mayo institution.

Dr. Herb's responsibilities of examining tissue in the pathology laboratory steadily increased while she was still associated with the Mayo Clinic. In the 11th Annual Report of St. Marys Hospital, she is listed as the only pathologist and Alice Magaw as the only anesthetist. Dr. Herb stayed in Rochester until 1904 when, after a study period in Europe, she moved to Chicago to do bacteriology research. She did not give up

**Table 2.**  
Growth in the Number of Beds and Operating Rooms at St. Marys Hospital \*

Year	Beds	Operating Rooms
1889	45	1
1893	75	2
1898	134	2
1904	150	
1905		3
1907	250	4
1909		5
1912	300	
1913		6
1914		7
1922	600	10

\* (From *Sketch of The History of the Mayo Clinic and the Mayo Foundation*, Division of Publications, Mayo Clinic, W. B. Saunders Company, 1926)



**Fig. 4.** Dr. Isabella C. Herb was the first physician anesthetist and the second female physician officially associated with the Mayo Clinic. She came to Rochester in 1899 and stayed until 1904.

anesthesia however and, in 1909, she became the chief anesthetist at the Rush Presbyterian Hospital in Chicago. She continued to work in the Chicago area as an anesthetist until her retirement in 1941.

Dr. Herb is noted for introducing on March 23, 1923, ethylene gas into anesthesia practice when she worked in Chicago (Fig. 5). She was persuaded to do this by a chemist, Dr. Arno B. Luckhardt, who was studying a previous discovery that this gas prevented carnation buds from opening. In his research, Dr. Luckhardt had observed that ethylene also possessed analgesic and anesthetic properties in animals and volunteers.

## 6. F. Florence Henderson

F. Florence Henderson (1874 - 1956) (Fig. 6) replaced Dr. Herb as Dr. Charles H. Mayo's anesthetist. She had graduated from Bishop Clarkson Memorial Hospital Training School for Nurses in Omaha, Nebraska, and began working at St. Marys Hospital in 1903. It is not known what responsibilities were assigned to her during the first months of her employment, but in the autumn of 1904, she began to administer anesthetics under the supervision of the Mayo brothers and Alice Magaw. Under Magaw's guidance,



Fig. 5. Dr. Isabella C. Herb administering ethylene to a patient in the presence of the chemist Dr. Arno B. Luckhardt, who is standing on the right. Dr. Herb introduced the use of ethylene as an anesthetic into clinical practice.

Florence Henderson developed into an outstanding anesthetist. Like her mentor, she preferred to use ether. She also gained, like Alice Magaw, a reputation at being very skilled at establishing a calming rapport with patients before induction of anesthesia. Dr. Henry S. Munro, a physician from Omaha, Nebraska wrote in his *Handbook of Suggestive Therapeutics* about Magaw and Henderson:

...I do not exaggerate in the least when I assert that it is quite the common occurrence for an anesthetist who does not understand the use of suggestion to use from ten to twenty times the amount of ether in anesthetizing a patient as is used by Alice Magaw and Miss Henderson, who make use of suggestion in every possible way in a given operation.

**Table 3.**  
Early Nurse and Physician Anesthetists at the Mayo Clinic \*

Anesthetist	Dates of Service	No. of Operating Rooms	Surgeon (in charge)
Edith Graham	1889 - 1893	2	Drs. W. J. and C. H. Mayo
Alice Magaw	1893 - 1918	2	Drs. W. J. and C. H. Mayo
Dr. Isabella Herb	1899 - 1904	2	Dr. C. H. Mayo
Florence Henderson	1904 - 1917	2	Dr. C. H. Mayo
Mary Hines	1905 - 1936	3	Dr. E. Starr Judd
Dr. Leda Stacy	1908 - 1910	4	Dr. Emil Beckman
Mary Shortner	1909 - 1949	4	Dr. Emil Beckman
Ann Powderly	1909 - 1950	4	Dr. C. H. Mayo

\* From Jeanne Pougiales, CRNA, *J. Am. A. Nurse Anesthetists*, 1970, 235-241.



Fig. 6. F. Florence Henderson, shown on the right side in this picture, taken when Dr. Charles H. Mayo was recuperating after emergency gall bladder surgery in New York in 1911. Dr. William Mayo had Ms. Henderson accompany him on a specially commissioned train to New York when he heard of his brother's illness. Ms. Henderson may have been included to function as an anesthetist if needed, but also as a supportive family friend.

Florence Henderson became a close personal friend of the Mayo brothers during the years she worked for Dr. Charles Mayo. When the latter needed surgery to remove gallstones while he was visiting in New York, Dr. William Mayo had her accompany him as he rushed by special train to be with his brother.

In 1917, Florence Henderson resigned from the Mayo Clinic and moved with her mother to Los Angeles, California, where she continued to work as an anesthetist until her retirement in 1923 at the age of 49 years.

In 1905, St. Marys Hospital added a third operating room (Table 2) for Dr. Edward Starr Judd, who had joined the staff as a junior surgeon. Mary Hines became his anesthetist (Table 3). She also administered anesthetics for the operations performed in this operating room by Dr. Emil Beckman, another junior surgeon, until 1907 when a fourth operating room was added to St. Marys Hospital.

**Table 4.**  
Distribution of Operating Rooms Among Institutions Affiliated with the Mayo Clinic (1925)\*

Institution	Operating Rooms
St. Marys Hospital	10
The Kahler Hospital	3
The Colonial Hospital	4
The Worrall Hospital and Annex	9
The Damon Hospital	1
<b>Total</b>	<b>27</b>

\* (From *Sketch of The History of the Mayo Clinic and the Mayo Foundation*, Division of Publications, Mayo Clinic, W. B. Saunders Company, 1926)



Fig. 7. St. Marys Hospital in 1925.



Fig. 8. The Kahler House



Fig. 9. The Colonial Hospital



Fig. 10. The Worrall Hospital

The Mayo institutions continued to grow and prosper during the next two decades. In addition to St. Marys Hospital (Fig. 7), other institutions became affiliated with the surgeons working in the Mayo partnership. These were the Kahler House (Fig. 8), the Colonial Hospital (Fig. 9), the Worrall Hospital (Fig. 10), and the Damon Hospital (Fig. 11). The number of operations performed during this period continued to grow (Table 1). By 1925, 27 operating rooms were available for the surgeons affiliated with the Mayo Clinic (Table 4). More nurse anesthetists were trained to help care for this increased surgical workload.

In 1909, Mary Shortner and Ann Powderly began their careers as nurse anesthetists in Rochester. Serena Huntimer, Amy Gillard, and Marguerite Fennel came later. All these nurses served for long periods and contributed significantly to the safety of anesthesia at the Mayo institutions. Others served only for shorter periods as anesthetists. Their names included Aurelia Sigafosse, Margaret Condon, Maude Hubbard, Madge Ayers, Ethel Bailey, Ethel Craddock, Erma King, Sara Thompson, Nellie Bryant, Regnhild Roback, Monica Tarsney, Gertrude Jones, Margaret Oberle, Jessie Asplin, and Irene Gordon.

The confidence of the surgeons in the skill of the experienced nurse anesthetist was clearly expressed by Dr. Charlie in the Transactions of the Southern Surgical and Gynecological Association in 1905. He stated:

We have regular anesthetists, three upon which we can depend (Alice Magaw, Florence Henderson, and Mary Hines), so that I can devote my entire attention to the surgical work. If I could not rely on someone at all times to give the anesthetic, I might be influenced to use local anesthesia in my work more than I do at present.



**Fig. 11. The Damon Hospital**

The value the Mayo brothers placed on the nurse practitioners of anesthesia is also well expressed in the response by Dr. W. J. Mayo to a letter written in 1924 by Dr. J. L. Allen from Calgary, Canada, to Dr. John S. Lundy (1894-1973), the newly appointed head of the section on anesthesia at the Mayo Clinic. Dr. Allen criticized a paper authored by Dr. J. F. Baldwin in the *American Journal of Surgery*, in which the nurse anesthetists were lauded as being far superior to physicians. Dr. Lundy forwarded this letter to Dr. Will and asked for a suggestion on how to respond.

Dr. W. J. Mayo answered:

Dear Dr. Lundy, I would suggest that you write to Dr. Allen to this effect: Nurses are used as technicians in anesthesia in our hospitals affiliated with the Mayo Clinic. They become extremely skillful in general anesthesia and save the physician a great deal of time. They are not anesthetists in the sense that a doctor may be, to give an anesthetic alone in a separate room, but are rather technicians in anesthesia who carry on the work under the supervision and direction of a medical man, usually the operating surgeon or one of his assistants who must be constantly present and takes full responsibility. In my opinion, this method of giving general anesthesia might be generally accepted...

## 7. Dr. Leda J. Stacy

Dr. Leda J. Stacy (1882-1973) (Fig. 12) was born in Rochester, Minnesota. She studied medicine at the Rush Medical College in Chicago and graduated in 1905. After an internship from 1905 to 1906 at the Children's Hospital in San Francisco, she returned to Rochester, her hometown, and opened a practice for general medicine. In February 1908, Dr. William called Dr. Stacy to his

office and asked her, if she would like to join the staff as a physician anesthetist. She accepted the offer and became the second physician anesthetist at the Mayo Clinic. Initially she worked under the tutelage of Alice Magaw and Florence Henderson. After 2 years, Dr. Stacy discontinued her work as an anesthetist and was placed in charge of radium therapy. In 1917, she became head of gynecology, a section of the division of medicine. In 1935, Dr. Stacy took a 1-year leave of absence but did not return to the Mayo Clinic.

## 8. Dr. Walter M. Boothby

In 1916, Dr. Walter Boothby (1880-1953) (Fig. 13) accepted an invitation from Dr. Henry S. Plummer (1874-1936) to join the Mayo Clinic and establish a metabolism laboratory for the diagnosis of thyroid disorders. Before coming to Rochester, Dr. Boothby had worked as a physician anesthetist in Boston, Massachusetts, where he was associated with Dr. Frederic Cotton (1869-



**Fig. 12. Dr. Leda J. Stacy came to the Mayo Clinic as a physician anesthetist in 1908. She changed her responsibility in 1910 and was put in charge of radium therapy. In 1917, she became head of section of radium therapy.**



Fig. 13. Dr. Walter M. Boothby (center), Dr. Harvey Cushing (right), and Dr. John Scott Haldane (left) in the respiratory laboratory of the Peter Bent Brigham Hospital in Boston, Massachusetts. Dr. Boothby was the anesthetist for Dr. Cushing in Boston before he came to the Mayo Clinic. He did not practice anesthesia at the Mayo Clinic. His work on resting metabolic rate and oxygen consumption in humans was a major contribution to medicine.

1938), a surgeon at the Children's, Boston City and Beth Israel hospitals. Together with Dr. Cotton, Dr. Boothby published several papers on anesthesia. He was, at that time, particularly interested in mechanisms underlying apnea during anesthesia, in developing an apparatus to administer nitrous oxide and oxygen simultaneously, and in the technique for intratracheal insufflation.

Dr. Boothby's interest in research in anesthesia was stimulated after Dr. Harvey Cushing appointed him director of the respiratory laboratory at the Peter Bent Brigham Hospital in Boston. Dr. Cushing described his duties as follows:

In addition, there is a supervisor of anesthesia who personally administers the anesthetics in the more difficult and responsible cases and who happens to be the desirable type of man who gives his full time and has charge of a laboratory for the special study of respiratory problems.

To prepare for this appointment, Dr. Boothby spent nearly a year with Dr. John S. Haldane (1860-1936) in Oxford, England. While in Europe, Dr. Boothby also visited the laboratories of two other famous respiratory physiologists, Sir Joseph Barcroft (1872-1947) in Cambridge, England, and Dr. August S. Krogh (1874-1949) in Copenhagen, Denmark.

Dr. Boothby assumed his appointment at the Peter Bent Brigham Hospital in December 1913. In this capacity he administered the anesthetics for many of the craniotomies performed by Dr. Cushing. For these procedures, Dr. Boothby used ether as the anesthetic agent. Interestingly, he

began to appreciate the importance of knowing the concentration of inspired ether and began to determine this concentration with a Connell anaesthetometer, which he calibrated with a Waller gas balance. Dr. Boothby already seemed to understand the importance of the inspired anesthetic concentration in a steady state of anesthesia. In 1914, he wrote in the *Journal of Pharmacology and Experimental Therapeutics*:

In order to determine ether tension it is necessary to establish equilibrium between the tension of ether in inspired air, alveolar air, blood and tissue— anesthetic tension is then equal to the tension of ether as delivered by the apparatus.

Dr. Boothby also appreciated how critical the rate of blood flow to different parts of the body is in governing the distribution of anesthetic gases in the patient. In the same paper, he stated:

Apparently the rate of saturation and desaturation vary with the relative mass of blood and the rate of circulation. In the same individual, different organs would be more or less quickly saturated and desaturated according to the proportional value of their blood supply.

Dr. Boothby's skill as an anesthetist was clearly missed after he left Boston and came to the Mayo Clinic. This point is shown in a statement made by Dr. Cheever in Boston in 1917 after Boothby left, in which Dr. Cheever recounts the death of a patient under ether anesthesia while undergoing minor surgery. It is inferred that young interns, usually entrusted to give anesthetics in hospitals cannot be relied upon. In this caveat, Dr. Cheever was echoing the earlier sentiments of the Mayos.

Unfortunately for the growth and development of anesthesia at the Mayo Clinic, Dr. Boothby never applied his talents to matters related to anesthesia while he worked in Rochester. Because thyroid disease was endemic in the Midwest, Dr. Boothby's work in successfully establishing a metabolism laboratory was more important to the institution than his being involved in anesthesia. Dr. Boothby's work on the metabolic rate and his contributions to aviation medicine during World War II (1939-1945) were major accomplishments. Only after the war did Dr. Boothby interact with anesthesia providers at the Mayo Clinic. Apparently, he had many stimulating discussions with Dr. Albert Faulconer, Jr., (1911-1985) about the measurement of partial pressures of ether in inspired gas and in the blood of patients. It is interesting to speculate what contributions Dr. Boothby could have made to anesthesia if he had chosen to concentrate his efforts in this field. As it is, he remains a giant in the field of respiratory physiology and metabolism.



Fig. 14. Dr. Louis Gaston Labat came to the Mayo Clinic from Paris, France, as a special lecturer in regional anesthesia. He left the Mayo Clinic after less than 1 year and went to New York City, where he continued to practice regional anesthesia.

## 9. Dr. Louis Gaston Labat

In 1920, Dr. C. H. Mayo visited the famous surgeon, Dr. Victor Pauchet in Paris, France. While assisting him in an operation, Dr. Mayo noted the skill his young assistant, a Dr. Gaston Labat (1876-1934) (Fig. 14), had in performing high-quality nerve blocks. With the permission of Dr. Pauchet, Dr. Mayo invited Dr. Labat to come to the Mayo Clinic in Rochester.

Of French extraction, Dr. Labat was born on December 11, 1876, in the Seychelles Islands. As a child, he was educated in Mauritius and in South Africa and then worked successively as a government clerk, machine designer and in his family's chemist shop in Mauritius before, at the age of 37 years, going to France to study medicine. His medical studies were performed in Montpellier and completed in Paris, where in 1916 he became an assistant to Dr. Pauchet.

Dr. Pauchet was not only a famous surgeon but also a successful writer. In 1914, he co-authored, together with Dr. Paul Sourdat, the commercially successful book, *L'Anesthésie Regionale*. When the third edition of the book was being prepared in 1921, Dr. Labat was invited to be the third author.

Dr. Labat arrived in Rochester at the end of September 1920 and gave lectures on regional anesthesia to the surgeons during the course of

the next 2 months. It was during this time he began to work on his textbook, *Regional Anesthesia Its Technic and Clinical Application* (Fig. 15). This text, written in English, was published in 1922 and rapidly became a commercial success. More than 50% of the illustrations in this book were reworks of the original illustrations. The other illustrations of this book were masterly prepared by Russell L. Drake (1896-1990), an experienced medical artist working at the Mayo Clinic. According to Dr. E. Rovenstine, the chair and professor of anesthesia at Columbia University, the attention to detail as well as its figures made this book a "classic."

Conjecture exists as to whether Dr. Labat planned to remain on staff at the Mayo Clinic, but it appears that he was invited with the intention to appoint him, and inquiries were initiated

## Regional Anesthesia

Its Technic and Clinical Application

By

Gaston Labat, M. D.

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With a Foreword by

William J. Mayo, M. D.

With 315

Original Illustrations

14 145

PHILADELPHIA AND LONDON

W. B. SAUNDERS COMPANY

1922

Fig. 15. Title page of the book published by Dr. Louis Gaston Labat in 1922. This book was written in part while he was working in Rochester. The illustrations were done in part by Russell Drake, an experienced medical artist working at the Mayo Clinic.

early on in his stay in Rochester to get him a Minnesota license. While in Rochester, with his marriage broken and his wife remaining in Mauritius, he lived with a lady friend from Paris. Given the moral climate of the day in a small Midwestern town, it is not unexpected, perhaps, that after less than 1 year in Rochester, Dr. Labat moved to New York City. He continued to practice anesthesia in New York until the early 1930s. He was a clinical professor at the Bellevue



**Fig. 16.** Dr. William R. Meeker became head of section on regional anesthesia after Dr. Labat had resigned from the Mayo Clinic.

Hospital. Three editions of his book were published, and he continued making original contributions to advancing regional anesthesia, particularly spinal anesthesia. In 1923, he established the forerunner of the current American Society of Regional Anesthesia. The *Gaston Labat Award* is this society's highest commendation and is given annually to the person who has made outstanding contributions to the development, teaching, and practice of regional anesthesia.

### **10. Dr. William R. Meeker**

On June 1, 1921, Dr. William R. Meeker (1889-1955) (Fig. 16) joined the Mayo Clinic to become head of the section on regional anesthesia, a position he held for more than 2 years. Dr. Labat's and Dr. Meeker's time in Rochester overlapped by

4 months. Dr. Meeker continued the tradition of Dr. Labat, giving local anesthesia and performing regional nerve blocks. Later, Dr. Meeker returned to his original specialty of surgery, first working in Chicago, Illinois and then in Mobile, Alabama.

### **11. Summary**

The first major period in the development of the specialty of anesthesia at the Mayo Clinic ended with the departure of Dr. Meeker. The circumstances in which the Mayos' father and sons began their practice at St. Marys Hospital led them to first utilize nurse anesthetists. They were fortunate in securing the services of some of the outstanding pioneers in nurse anesthesia. The skills of these early nurse anesthetists helped the institution in establishing its reputation in surgery. Early physician anesthetists at the Mayo Clinic stayed only a short time, although several of them made valuable contributions to advancing the specialty and medicine in general. Dr. Herb returned to practice anesthesia in an academic setting after she resigned from the Mayo Clinic. Dr. Stacy changed her specialty after practicing anesthesia for only 2 years at the Mayo Clinic. Dr. Labat left the clinic after less than a year but subsequently solidified his reputation as an expert in local and regional anesthesia in New York City. Dr. Meeker returned to his original specialty of surgery after 2 years of practicing anesthesia at the Mayo Clinic. Dr. Boothby, who had given anesthetics in Boston for Dr. Cushing, was involved only in anesthesia at the periphery while he was in Rochester. It took a very special person to stay on as a physician anesthetist at the Mayo Clinic and build a department of anesthesiology of excellence. That individual was Dr. John S. Lundy.

*Kai Rehder and Peter A. Southorn*

## II. The Growth

(1924 to 1950s)

In its early days, the Mayo Clinic experienced difficulty in attracting and retaining physician anesthetists. This problem did not seem to impair the institution's growth as a center of surgical excellence, it being well served through this period by a succession of dedicated nurse anesthetists skilled in administering ether. Elsewhere major advances were being made at an accelerating pace in the science and practice of anesthesia, particularly through the years of World War I (1914-1918). In part, because of this progress, surgical innovations also continued to advance and someone had to be found to incorporate them into the practice of the Mayo Clinic in order for this institution to continue to flourish.

Examples of this continued progress through the early history of the Mayo Clinic abound. In 1898, 9 years after St. Marys Hospital opened, August Bier (1861-1949) introduced spinal anesthesia, which was subsequently advanced by Theodore Tuffier (1857-1929). In 1899, Rudolph Matas (1860-1957) employed artificial ventilation using bellows to perform thoracic surgery. In 1900, Carl Landsteiner (1868-1943) described the ABO blood groups, and within 10 years blood transfusion became practical. Extradural caudal anesthesia was introduced in 1901. Willhelm Einthoven (1860-1927) recorded the first electrocardiograms using a string galvanometer in 1903. The first barbiturate and synthetic local anesthetics were also introduced about this time. Arthur Barker (1850-1916), in 1907, prepared hyperbaric solutions for spinal anesthesia. That year, Chevalier Jackson (1865-1958) described his work on laryngoscopy. Some anesthetic machines already existed before 1910, when Elmer McKesson (1881-1935) introduced his on-demand, intermittent-flow nitrous oxide and oxygen anesthetic machine, which permitted calibration of the percentage of the two gases received by the patient. In 1911, Goodman Levy (1856-1954) proved that ventricular fibrillation was the usual cause of death associated with light chloroform anesthesia. The subsequent year, Walter Boothby (1880-1953), before coming to the Mayo Clinic while still in Boston working with Frederic Cotton (1869-1938), introduced a new type of gas

flow-meter. James Gwathmey (1863-1944) published his classic textbook, *Anesthesia* in 1913. In 1920, Arthur Guedel (1880-1953) using his wartime experiences in giving anesthesia published his first paper describing the physical signs associated with different planes of ether anesthesia. Eventually, his signs were to come into common usage, supplanting the physical signs originally described by John Snow (1813-1853). That same year, Ivan W. Magill (1888-1986) and E. Stanley Rowbotham (1890-1979) developed endotracheal anesthesia. Importantly, in the context of the history of anesthesia at the Mayo Clinic, ethylene was also introduced into clinical practice about this time.



Fig. 1. Dr. Lundy was head of the section on anesthesia at the Mayo Clinic from 1924 to 1952 and a senior consultant from 1952 to 1959. Dr. Lundy was a visionary; he helped the specialty of anesthesia to grow and be respected. He received many honors. This picture shows Dr. Lundy performing an abdominal field block. The picture was taken by Dr. Philip D. Woodbridge at the Anesthetists' Travel Club meeting in Rochester in 1938.



Fig. 2. Historical family portrait of the Mayo family painted by the Norwegian artist Mr. Brynjulf Strandenes. Dr. and Mrs. William Worrall Mayo are sitting in the gallery observing the operation. On the left side of the operating table from the front: Dr. Joseph G. Mayo, Dr. Charles W. Mayo, Dr. William J. Mayo (talking to the audience in the gallery), Dr. Charles H. Mayo (holding a roentgenogram in his right hand). On the right side of the operating table from the front: Dr. Waltman Walters and Sister Joseph, scrub nurse of Dr. William J. Mayo. With the back to the viewer is Dr. John S. Lundy administering the anesthetic. He is the only person in this picture who does not belong to the Mayo family.

## 1. Dr. Lundy Joins the Staff of the Mayo Clinic

A very special person with drive and ambition, energy, endurance, firmness, and tenacity was needed to establish physician anesthesia at the Mayo Clinic. This person was Dr. John Silas Lundy (1894-1973) (Figs. 1 and 2).

When Dr. Lundy was invited by Dr. Will Mayo to come to Rochester, Minnesota, in 1924, he had warned Dr. Lundy that he might have a difficult time succeeding at the Mayo Clinic. Fortunately, Dr. Lundy was not easily discouraged, perhaps in part attributable to his own ebullient nature and also because he hoped he could rely on the support of two of his medical school classmates, Dr. Waltman Walters (1895-1988) and Dr. Virgil S. Counsellor (1892-1977), who were already staff surgeons at the Clinic.

Lundy grew up in the Dakota Territories. When he was 18 months old, his father, a general practitioner, died of pneumonia. As a schoolboy

Lundy helped administer general anesthetics to patients of the doctor in the local community. Lundy graduated from the University of North Dakota in 1917 and entered Rush Medical College in Chicago, Illinois, where he qualified as a physician in 1920. After an internship at Harper Hospital in Detroit, Michigan, he went west, and in 1921, he began giving anesthetics at the Columbus Hospital in Seattle, Washington. Like other physician anesthetists at that time, he had no formal training in anesthesia. This shortcoming did not stop Dr. Lundy from trying out new techniques and drugs almost immediately. In 1921, he bought a used Gwathmey anesthetic machine, and in 1923, he had Richard Foregger (1873-1960) of New York City build him a portable anesthetic machine equipped to deliver four gases (nitrous oxide and oxygen, oxygen, carbon dioxide, and ethylene) and also to administer ether. This was the first apparatus of its kind. With it, he began to administer the new anesthetic gas, ethylene. In total, he administered 1,293 anesthetics in the 2 years, 1922 and 1923. For this, he collected approximately \$14,000 in fees, thereby producing an annual income before expenses of about \$7,000.

In Seattle, Dr. Lundy became active in the King County Medical Society. Appointed editor of the society's bulletin, he increased the number of its pages from 4 to 32, paying for these with advertisements. At the annual banquet of the society in 1924, Dr. Lundy was rewarded for his efforts by being made the secretary of the society. The invited guest speaker that night was Dr. Will Mayo, who was passing through town on his way to Australia and New Zealand. At the banquet, Dr. Lundy was seated across the table from Dr. Mayo. Never shy and always ready to grasp any opportunity, Dr. Lundy proceeded to tell the distinguished surgeon about his experiences with the new anesthetic ethylene. It became apparent from their conversation that this type of anesthetic was not being used at the Mayo Clinic and that Dr. Mayo was unfamiliar with it. Impressed by the young physician's knowledge, enthusiasm, and audacity, Dr. Will asked Dr. Lundy to walk with him to the railroad station after the dinner. On their way, Dr. Lundy continued to talk about anesthesia and the need to perform research in it, though given his own circumstances at the time, he felt he couldn't participate in this research. The end result of their conversation was that Dr. Mayo invited Dr. Lundy to come to Rochester to the Mayo Clinic, an offer that was immediately accepted. Dr. Lundy arrived in Rochester in the spring of 1924, before Dr. Will had returned from his trip to Australia and New Zealand.

Dr. Lundy was 30 years old at the time. His mother, to whom he was always close, joined him soon thereafter in Rochester, and they lived in the College Apartments, Unit G-4. On September 5, 1925, he married Miss Leonore Mittelstadt from St. Paul. Subsequently, they had three children, Richard Allen, Joan Leonore, and John Charles.

When Dr. Lundy arrived 18 nurse anesthetists were employed at the Mayo Clinic. The institution had excellent facilities to give anesthetics, but few, if any, resources to conduct anesthesia research. Dr. Lundy's own feelings at the time were recounted later by him:

I had the experience of a feeling of isolation being a member of this special field of medicine. Coming to the Mayo Clinic on the 27th of March 1924, I found myself to be the only doctor interested in anesthesia, other than those who had encouraged me to come here. This meant Dr. W. J. Mayo and Dr. D. C. Balfour, at Dr. Mayo's suggestion. On arrival I had no office or secretary, and my prospects were only those I could visualize in my imagination....

Dr. Lundy also recalled that, even though he was now in a medical building less than 10 years old, his own desk and office consisted of an upturned apple crate left in a corridor. Nevertheless, he remained confident about his chances at the institution. On May 17, 1924, he mailed letters to Mr. Foregger and Dr. Wallace Calvin Abbott (1857-1921), in which he expressed this confidence. To Mr. Foregger he wrote:

...The Clinic may not agree with me about the need for new machines right away. In time, of course, I will no doubt have it my way...

To Dr. Abbott he wrote:

...I find that mine (department) was about the last department to be organized and for that reason, I have extraordinary facilities at my disposal, more in fact, than some others had when they were organizing.

Later on in his life, he stated that at this early time he resolved to:

...make one contribution to anesthesia for each of the 35 years that lay ahead of me...

Little, if any, evidence exists that Dr. Lundy doubted that he would not succeed. But on May 27, 1924, he wrote to a Miss A. Katherine Woods expressing some uncertainty:

... and the local anesthesia that I am learning is very enlightening and would make a wonderful addition to my earning power if I were to go elsewhere...

## 2. The Growth of the Section on Anesthesia

Upon his appointment, Dr. Lundy was named head of the section on regional anesthesia. Writing to a friend, Dr. J. C. Moore, on October 20, 1924, he described his clinical work in the first



Fig. 3. Dr. Charles F. McCuskey was the first staff physician who joined Dr. Lundy at the Mayo Clinic. In 1933, Dr. McCuskey resigned from the staff of the Mayo Clinic to move to Los Angeles, California.

few months:

Thus far I have confined myself principally to the application of regional anesthesia and have, I think, learned a great deal . . . I have started my course of lectures to the nurses at St. Marys already. It is exactly the same course that I gave to the nurses in the Seattle hospitals for the last three years. The more I practice the local anesthetics, the better I think of the lectures, which I give those girls.

On November 26, 1924, the board of governors of the Mayo Clinic elected Dr. Lundy a full member of the faculty. Dr. Donald Balfour (1882-1962) quickly recognized Dr. Lundy's expertise and encouraged him to speak about anesthesia to the Surgical Society of the Mayo Clinic. Dr. Lundy seized this and every opportunity like it to demonstrate to the surgeons and the institution at large his knowledge, vision, and enthusiasm.

In 1925, Dr. Charles F. McCuskey (1893-1980) (Fig. 3) joined Dr. Lundy as a special student in anesthesia. In the subsequent year, Dr. McCuskey was promoted to a consultant and became the second member of the section on regional anesthesia. He received a salary of \$3,000 per year. Soft-spoken, with an attractive manner and well liked, Dr. McCuskey possessed all the attributes of a leader. He worked with Dr. Lundy at the Mayo Clinic until 1933, when he moved to Los Angeles. He was made president of the American Society of Anesthesiologists (ASA) in 1948.



Fig. 4. Dr. Ralph M. Waters joined Dr. Lundy in the summer of 1926 for training in regional anesthesia. Dr. Waters became chairman of the department of anesthesiology at the University of Wisconsin in Madison. This picture shows Dr. Waters demonstrating his carbon dioxide absorption technique to Drs. Wiggins, Tuohy and a student at the Anesthetists' Travel Club meeting in Minneapolis in 1938.



Fig. 5. Dr. Ralph M. Tovell became the third staff physician in the section on anesthesia at the Mayo Clinic. Dr. Tovell joined the staff in 1929. He resigned in 1936 to become head of anesthesia at Hartford Hospital in Hartford, Connecticut.

In 1926, Dr. Ralph M. Waters (1883-1979) (Fig. 4) spent 3 months working with Dr. Lundy to acquire skills in regional anesthesia. By this time, Dr. Lundy had become a recognized expert in sacral and caudal anesthesia. Dr. Waters moved to Madison, Wisconsin, to direct the anesthesia services in the university hospital. In 1933, he was appointed professor of anesthesia, the first such professorial post in anesthesia. Dr. Waters established the first resident training program in anesthesia and had a long and distinguished career. His institution was to become one of the leading centers of anesthesia during his lifetime.

In 1929, Dr. Francis H. McMechan (1879-1939) the secretary general of the International Anesthesia Research Society recommended Dr. Lundy recruit Dr. Ralph M. Tovell (1901-1967) (Fig. 5). At the meeting of the board of governors, Dr. Lundy succeeded in having Dr. Tovell's appointment accepted. Dr. Tovell was the third physician staff member of the section. He possessed great organizational skills and became an expert on anesthesia records. Dr. Tovell remained in Rochester until 1936, when he too left to become head of anesthesia at Hartford Hospital in Hartford, Connecticut. He was appointed associate editor of the journal *Anesthesiology* and was elected president of the American Society of Anesthesiologists in 1941.



Fig. 6. Dr. Edward B. Tuohy was appointed to the staff of the Mayo Clinic in 1935. He resigned from the staff in 1947 to become head of anesthesia at Georgetown University Hospital, Washington, D. C. He was the first anesthesiologist to defend successfully a Master of Science thesis in the specialty of anesthesia.



Fig. 7. Dr. Tuohy, president (left), Dr. McCuskey, president-elect (second from left), Dr. Hickcox, secretary (second from right), and Dr. Krakow, treasurer (right) of the American Society of Anesthesiologists.

Dr. Edward B. Tuohy (1908-1959) (Fig. 6) joined the section on anesthesia and intravenous therapy of the Mayo Clinic in 1935. His main interest was general physiology, but he was productive in several fields. He remained on staff at the Mayo



Fig. 8. Dr. R. Charles Adams was appointed to the staff of the Mayo Clinic in 1937. Dr. Adams succeeded Dr. Lundy in 1952 as head of the section on anesthesiology and intravenous therapy. He resigned as chairman in 1953 because of poor health.

Clinic until 1947, when he became head of anesthesia at Georgetown University Hospital, Washington, D.C. Dr. Tuohy, like Drs. Lundy, Tovell and McCuskey, was honored for his contributions to anesthesia by being elected president of the American Society of Anesthesiologists in 1947 (Fig. 7).

Dr. R. Charles Adams (1906-1956) (Fig. 8) was appointed to the staff in 1937. He became an acknowledged authority on intravenous anesthesia. In 1944, he wrote a 700-page monograph, *Intravenous Anesthesia*, describing its development from 1872 to that time. This monograph represented a big step in advancing this method of giving anesthetics.

The next person to join the consultant staff was Dr. Lloyd H. Mousel (1903-1970) (Fig. 9) who was appointed in 1939. In his career he became an authority on anesthetic problems associated with chest surgery. Dr. Mousel resigned in 1946 to become head of anesthesia at George Washington University, School of Medicine in Washington, D.C. Later, he moved to the West Coast and worked in the Swedish Hospital in Seattle, Washington.

In 1940, Dr. Thomas H. Seldon (1905-1991) (Fig. 10) joined the staff. He was to receive national recognition for his expertise in blood banking and blood transfusions. His career culminated in his being appointed and serving for many years as editor-in-chief of the journal *Anesthesia and Analgesia*.



Fig. 9. Dr. Lloyd H. Mousel joined the staff of the Mayo Clinic in 1939. He resigned from the staff in 1946 to become head of anesthesia at George Washington University, School of Medicine in Washington D. C.



Fig. 10. Dr. Thomas H. Seldon was appointed to the staff of the Mayo Clinic in 1940. He became an expert on blood banking and blood transfusion.

In 1946, Dr. Pender (1912- ) (Fig. 11) joined the staff. With Dr. Tuohy, he trained nurse anesthetists until this responsibility was assumed by Dr. Paulson. In 1954, Dr. Pender left the Mayo Clinic to become head of the department of anes-



Fig. 11. Dr. John W. Pender joined the staff of the section of anesthesiology at the Mayo Clinic in 1946.



Fig. 12. Dr. John A. Paulson joined the staff of the Mayo Clinic in 1947. He was responsible for nurse anesthesia training and, with Dr. Virginia B. Hartridge, was responsible for anesthesia in orthopedic surgery.

thesiology at the Palo Alto Medical Clinic in California. While there he became a member of the editorial board of the journal *Anesthesiology*.

Drs. John A. Paulson (1908-1994) and Albert Faulconer, Jr. (1911-1985) were appointed consultants in 1947. Dr. Paulson (Fig. 12) specialized in anesthesia for orthopedic surgery and was active in the training program for nurse anesthetists.

Dr. Faulconer (Fig. 13) was unofficially appointed to the staff in 1946, while still working as a fellow on his research project in the aeromedical laboratory of the Mayo Clinic. This pre-emptive appointment was viewed as necessary because, as Dr. Lundy wrote in his annual report to the board of governors of the Mayo Clinic in 1946, "his superior intellect and enthusiasm." Dr. Faulconer's superior intellect was apparently widely recognized, because Harvard Medical School also sought to appoint him to their staff. Dr. Faulconer's appointment was officially recognized in 1947, after he completed his Master of Science thesis.

Closing out this period in the development of the department, during the late 1940s and early 1950s, four consultants joined the department. They were Dr. Roger W. Ridley (1918 - ), Dr. John E. Osborn (1919-1957), Dr. Raymond F. Courtin (1912 - ) and Dr. Robert T. Patrick (1920-1999). In 1955, Dr. Ridley moved to California. Tragically, Dr. Osborn died in 1957



Fig. 13. Dr. Albert Faulconer, Jr., was officially appointed to the staff of the Mayo Clinic in 1947. He made many outstanding contributions to the science of anesthesia. In 1953, Dr. Faulconer became the chairman of the section on anesthesiology and intravenous therapy, which was renamed in 1970, as the department of anesthesiology. As chairman, he contributed significantly to the growth of the department and to the recognition of the specialty of anesthesia intramurally, nationally and internationally.

from a brain tumor. Subsequently, Dr. Patrick left the institution for an appointment in California. Dr. Courtin also left, becoming the chair of the department of anesthesiology at Baylor University in Dallas, Texas.

### 3. Training and Education

#### *Residents and Fellows*

Once the section on regional anesthesia was formally constituted with Dr. McCuskey joining Dr. Lundy in 1925, residents from other disciplines in medicine and surgery began spending a quarter or more with them. The quality of the training these residents received and the clinical experiences they encountered were soon appreciated, and the program attracted many persons who wanted to pursue a career in this discipline. Eventually, a program for postdoctoral training in the University of Minnesota Graduate School at Rochester was instituted, with this training leading to a graduate degree in anesthesia. Dr. Tuohy, who originally had come to the Mayo Clinic as a fellow in internal medicine, was the first person in the United States to obtain (1936) the degree of Master of Science in anesthesia. The title of his dissertation was *A Comparative*

*Study of the Physiological Activity of Cobefrin and Epinephrine*. The training program for this fellowship continued to evolve and eventually ended up as a 3-year program that included clinical experience in anesthesia, transfusion of blood, and use of oxygen and helium. The fellowship also entailed 6 months of research in the institute of experimental medicine at the Mayo Clinic. Before Dr. Lundy retired in 1959, the section successfully trained approximately 90 residents in anesthesia, as well as 250 other physicians and 210 dentists, many of the last two groups during World War II (1939-1945) in short courses for military service.

The size of this residency training program limits the discussion of careers to those fellows who entered the program early on and who subsequently were to make major contributions to this field. Many fellows who trained at the Mayo Clinic had illustrious careers. A photograph of each these fellows and the year of completion of their training are listed at the end of this book.

Reference has already been made to one person who came to Rochester to receive anesthesia training under the tutelage of Dr. Lundy, namely, Dr. Ralph Waters. In many respects, he is the most illustrious person in the training program and is now regarded as one of the father figures of academic anesthesiology.

In 1927, Dr. Philip D. Woodbridge (1895-1978) joined the section as a first assistant. Dr. Lundy wanted him to join the department, but Dr. Woodbridge declined this invitation and left to work with Dr. Lincoln F. Sise (1875-1942) in the department of anesthesiology at the Lahey Clinic in Boston, Massachusetts. Later on, Dr. Woodbridge became a respected professor of anesthesiology at Temple University Medical School in Philadelphia, Pennsylvania. Dr. Paul W. Searles (1908-1995), another early resident, became head of anesthesia at the University of Buffalo Medical School, Buffalo, New York. Dr. Charles J. Betlach (1909 - ) subsequently became head of anesthesia at Cook County Hospital in Chicago, Illinois. Dr. Ralph Knight (1886-1972) was named chairman of the department of anesthesiology at the University of Minnesota in Minneapolis (Fig. 14). Another early resident was Dr. William N. Hardman (1906- ), who subsequently was appointed head of the department of anesthesiology at Creighton Memorial St. Joseph's Hospital in Omaha, Nebraska.

#### *Medical Officers of the Armed Forces*

In 1938, Dr. Lundy contacted Lieutenant Colonel Joseph F. Gallagher to suggest improve-



Fig. 14. Dr. Ralph Knight trained as an anesthesiologist at the Mayo Clinic. He became the first chairman of the department of anesthesiology at the University of Minnesota in Minneapolis. Dr. Knight presents in 1949 a silver tray engraved with 255 signatures of trainees and colleagues to Dr. Lundy.

ments in the anesthetic care provided to the members of the armed forces. Based on his trip to Europe in that year, Dr. Lundy became aware that the United States could soon be involved in a war. Dr. Lundy wrote:

...I have thought of offering the opportunity for some men from the medical corps to come and receive training in anesthesia. What do you think of that? And do you think it would be possible to get them to provide some officers who would make it their business to supervise anesthesia in the army hospitals now and more especially in the time of war?...

In World War II (1939-1945) the section on anesthesia provided graduate training to 153 army medical officers and 5 Veteran Administration medical officers. Many of these officers continued to practice anesthesia after their discharge from the armed services. During the war, Dr. Lundy spent 1 week of every 8 weeks working in the office of the surgeon general of the army.

#### *The Anesthesia Foundation*

Near the end of his career in 1956, Dr. Lundy, with the help of Dr. Whitaker in Cleveland and Dr. Scott M. Smith (1912 - 1986), president of the American Society of Anesthesiologists, raised \$8,000 to start the Anesthesia Foundation. The goal of this philanthropic foundation was to help improve the training in anesthesia and to advance recognition of the specialty. This foundation made loans to deserving physicians to assist them in financing their training and awarded grants of \$1,000 for essays prepared by senior medical students on subjects related to

anesthesia. This foundation continues to be a positive force at the present time.

#### *Training of Nurse Anesthetists*

Dr. Lundy always supported the anesthesia care team and nurse anesthetists. Speaking to the section of anesthesiology of the Mayo Clinic on October 28, 1967, he stated:

Recent emphasis upon the necessity of using paramedical personnel as much as possible in the practice of clinical medicine as a means of enhancing the effectiveness of the physician only points out the wisdom of our use of nurse anesthetists in years gone by.

Dr. Lundy assumed responsibility for the training of nurse anesthetists after his appointment on the staff. There was no formal application to enter the field at that time. Nurses interested in becoming anesthetists would apply to Dr. Lundy, and if there was a position open at the Mayo Clinic, they would be accepted for training. To accomplish this, they were assigned to work in one area with a staff anesthetist. Generally, they did not rotate into other clinical areas during their training. When the trainees were judged to be technically and clinically proficient, he or she would be assigned to perform activities more independently, but always under the supervision of Dr. Lundy or one of his colleagues. In the middle 1940s, this educational program for nurse anesthetist students became more structured and a didactic program was added to the education. Dr. Virginia B. Hartridge (1919 - ) (Fig. 15) was responsible for important changes. For further details, the interested reader is referred to chapter V. Education. Some of the nurse anesthetists who trained at the Mayo Clinic were to have important roles in the department of anesthesiology.

#### **4. Clinical Practice and Administration**

In 1924, the year Dr. Lundy arrived at the Mayo Clinic, 6,621 anesthetics were given at St. Marys Hospital and the total number of operations performed in all the institutions affiliated with the Mayo Clinic was 23,628. According to the 40th Annual Report of St. Marys Hospital for 1929, 7,424 anesthetics were given at that hospital by 4 physician anesthetists and 27 nurse anesthetists (Table 1). Local anesthesia was used in 1,746 patients and 689 patients received a spinal anesthetic. In patients who received a general anesthetic, ether was employed as the primary agent in 5,169 patients, ethylene in 3,682 patients, and nitrous oxide in 3,182 patients (Table 2). Many patients received a com-

**Table 1.**

Anesthesia Staff and Number of Surgical Procedures at St. Mary's Hospital\*

Year	Physician Anesthetists	Nurse Anesthetists	Number of surgical procedures
1924	3	18	6,621
1925	5	22	7,026
1926	5	19	7,288
1927	5	17	7,548
1928	4	23	7,531
1929	4	27	7,424

\* From Annual Reports of St. Mary's Hospital, Rochester, Minnesota.

bination of these anesthetic agents. For a long time, the Mayo Clinic made no special charge for these anesthetic services. The patients received one bill only for the performance of the surgery, until Dr. Faulconer's chairmanship.

The section underwent several name changes during Dr. Lundy's tenure as its chairman. When he joined, in 1924, the section was called the section on regional anesthesia. In 1931, the section was renamed the section on anesthesia. In 1933, this title was expanded to the section on anesthesia and intravenous medication. The name was changed again in 1934 to the section on anesthesia and intravenous therapy. Following a national trend and at the request of Dr. Lundy, the name was again modified to the section on anesthesiology and intravenous therapy in 1944. After Dr. Lundy had retired in 1962, the intra-



Fig. 15. Dr. Virginia B. Hartridge organized during the 1950s the first curriculum for training of nurse anesthetists at the Mayo Clinic.

venous therapy component in the title was dropped. Eventually, the section became a department in 1970, the same year the sections in medicine and surgery became departments.

Dr. Lundy remained the head of the section for 29 years. In 1952, he was relieved of this leadership position under Dr. Lundy's protest. In the annual report to the board of governors for 1952, he stated:

The year 1952 was the most unsatisfactory year for me since I arrived at the Mayo Clinic on March 27, 1924. Only by request was I allowed to finish twenty-nine years as Head of the Section and I was relieved of that assignment under protest on the 31 st of March. For the months of January, February and March of 1952 I carried out the routine duties and subsequently since my direction was not wanted, I seldom attended our staff meeting unless there was some request for my presence or if I had something that I thought I should bring up. In the middle of August I was told I should transfer my activities to the Worrall and Worrall Annex, and I spend my last working day at St Mary's on September 5, 1952, my twenty-seventh wedding anniversary, and the next day began to work at the Worrall and Worrall Annex. The going-away party given for me at St. Mary's by the surgical head nurses, surgical recorders, surgical laboratory technicians, nurse anesthetists, etc. was very touching and their kindness was very much appreciated, especially at a time like this.

I was warmly received at the Worrall and Worrall Annex.

Who and what was behind the removal of Dr. Lundy from the chairmanship is not known, but probably did not come from members of his section. Dr. Lundy continued to work at the Mayo Clinic as a senior consultant until his retirement in 1959. Thereafter, he moved to Chicago, Illinois, and then to Seattle, Washington, where he continued to practice anesthesia.

Dr. Adams was appointed to succeed Dr. Lundy as head of the section on anesthesiology and intravenous therapy on April 1, 1952.

**Table 2.**

Anesthetic Techniques and Agents Used at St. Mary's Hospital\*

Year	Local	Spinal	Ether	Ethylene	Nitrous oxide	Carbon dioxide
1924	1,199	0	5,334	2,685	131	28
1925	1,956	0	5,386	3,196	399	837
1926	1,924	0	5,943	3,677	509	556
1927	1,358	98	6,210	4,115	1,582	2,392
1928	1,567	287	5,911	4,071	2,664	3,263
1929	1,746	689	5,169	3,682	3,182	3,758

\* From Annual Reports of St. Mary's Hospital, Rochester, Minnesota. Anesthetic agents listed were used mostly in combinations.

Unfortunately, he was dogged by ill health, having severe hypertension and could only remain in this position until October 1953, when Dr. Faulconer was appointed the third head of the section. Under the able and visionary leadership of Dr. Faulconer, the section continued to grow and made many valuable contributions to the progress of the specialty. During Dr. Faulconer's chairmanship, the consultants working at St. Marys Hospital and the Methodist Hospital were formed into separate administrative entities and subspecialty groupings of consultants, including those specializing in neuroanesthesia and cardiovascular anesthesia, intensive care and anesthesia research started to develop, a practice pattern that persists to the present day.

### 5. Scientific Innovations and Contributions by the Early Staff

Dr. Lundy was an intelligent, energetic inventor and tinkerer throughout his career. He also, fortunately for him, possessed the knack of self-promotion. In his earliest days in Rochester, he resolved to establish a name for himself by making contributions to the specialty. To quote Dr. Lundy on this subject:

...I tried to keep five projects in anesthesia going at all times hoping for one good harvest each year while I was here...

He succeeded in this endeavor and wrote numerous papers during his lifetime. In addition to some major contributions to the specialty, which were epoch making, he introduced many useful, practical innovations throughout his career. For example, before his arrival at the Mayo Clinic, he had been interested in mechanical ventilation of the lungs of anesthetized subjects. He worked on this project until 1932, when he finally developed a prototype respirator. To

maintain sterility of the surgical field, he designed an anesthesia screen to separate the surgeons from the anesthetists. He also developed an armboard to support the patient's arms during surgery. An introducer for spinal puncture needles and the Lundy universal laryngoscope were other innovations produced by him. In his publications, he was a proponent of the plastic needle (Fig. 16) for intravenous injections and infusions, which had been developed by Dr. David J. Massa (1923 - ). Dr. Lundy also modified the tip of the Magill endotracheal tube to allow for its easy insertion during blind nasal intubations.

Throughout his career at the Mayo Clinic, Dr. Lundy also interested himself and published papers on numerous other aspects of the specialty, including dental anesthesia, headaches, chronic debilitating pain, iatrogenic hazards encountered in the practice of anesthesia, the addiction to medications by medical and paramedical personnel, fires and explosions, single operator anesthetics, and giving anesthetics during war and civil disorders.

In addition to his publications, Dr. Lundy and his colleagues at the Mayo Clinic made some fundamental contributions to the specialty. These are outlined in the following paragraphs.

#### *The Use of Ethylene as an Anesthetic*

As soon as Dr. Lundy began work at St. Marys Hospital, he started promoting the use of ethylene. Although unpleasant to smell, the agent produced a rapid induction of anesthesia, muscle relaxation and recovery from its effect was quick. The main disadvantage, which was well known, was the explosive propensity of the agent. One explosion with its use occurred early on, after it had been introduced into the clinical practice at St. Marys Hospital. To decide whether the use of

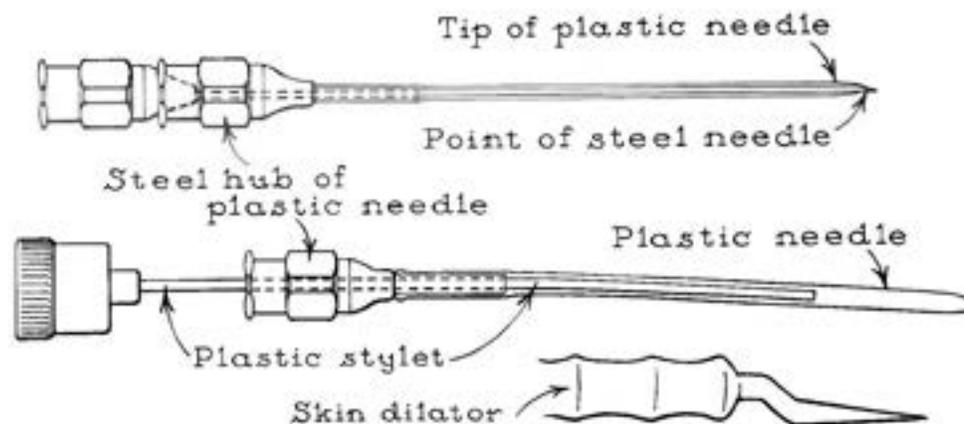


Fig. 16. Plastic needle for intravenous infusions.

ethylene was still acceptable after this explosion, Dr. Lundy requested the advice of Dr. Isabella C. Herb (1863 or 1864-1943) in February 1925. Dr. Herb had introduced ethylene into clinical practice in Chicago and was a former Mayo Clinic physician anesthetist. She wrote back in a letter dated February 24, 1925:

...We have temporarily suspended the use of Ethylene at the Presbyterian until precautions can be taken to prevent explosions due to static spark. We are investigating methods for the control of same, but they are not as yet sufficiently advanced to give out information...

Despite this letter, Dr. Lundy continued to advocate the use of ethylene provided appropriate precautions were taken to prevent explosions. These precautions were described in a letter by him sent in March 1925 to the Iowa Methodist Hospital.

...We have had no explosions from static accumulating in the gas machine but, realizing that static is a potential danger, the heads of all the gas machines have been grounded to COLD water pipes. Anesthetists have been warned to prohibit occupants of the operating room from coming into contact with the gas machine. No cautery or other electrical apparatus capable of igniting an inflammable gas is permitted in the surgery when ethylene is being used... Rebreathing is generally employed to permit of an escape of a minimum amount of ethylene into the room... Breathing bags are moistened on their inner surfaces...

### ***The Use of Carbon Dioxide***

From 1924 on, again coinciding with his arrival in Rochester, Dr. Lundy became a proponent for using carbon dioxide to stimulate respiration (Table 2). He was extremely enthusiastic about the use of this gas in a presentation to the University Club of Rochester on June 8, 1925, he said:

...I anticipate that it will be at least the biggest thing since we have gotten ahold of ether or nitrous oxide...

The famous physiologist, Dr. Yandell Henderson, had suggested that adding carbon dioxide to the inspired gas to stimulate respiration would be of value in speeding up the elimination of ether at the end of an anesthetic. Dr. Lundy's innovation was to add carbon dioxide to the inspired gas during induction of the anesthetic to counteract any respiratory depression and to speed up the induction.

Many anesthetists copied Dr. Lundy's use of carbon dioxide at the time, and subsequently, for many years, anesthetic machines were equipped to give carbon dioxide. In these early days, although Dr. Lundy was working on such a device, mechanical ventilation had not been introduced into clinical practice and anesthetists often depended on pharmacological stimulation

of respiration. In this use of carbon dioxide, Dr. Lundy and Dr. Ralph Waters had a difference of opinion, a subject that will be discussed later in this chapter.

### ***Creation of the Division of Anatomy***

Again early on in his career, Dr. Lundy recognized that knowledge of the gross anatomy of nerves, blood vessels, and bones was extremely important for the successful practice of regional anesthesia. In June 1925, he proposed to Dr. Will Mayo:

...to give the surgical fellow anatomy from a new viewpoint, that is, a practical knowledge of the location of bones, nerves, and blood vessels and their relation to the skin surfaces of the body. This would attract to my service an additional number of Fellows and in time would be, I think, one of the most sought after services at the Clinic...

Dr. Will responded immediately:

Thank you for your letter of June 18, which I have read with interest. Your idea of systematized experimental dissecting in connection with the department of anesthesia I think is a good one...

This correspondence led to the creation of the section of anatomy at the Mayo Clinic. Dr. Lundy was its first head, followed much later by Dr. William H. Hollinshed (1906-1986). When the Mayo Foundation first established its medical school and after the retirement of Dr. Hollinshed, Dr. Duane K. Rorie (1936 - ) in the department of anesthesiology had the task of teaching anatomy to the first medical students until a full time anatomist could be appointed to this position.

### ***The Concept of Balanced Anesthesia***

In 1926, Dr. Lundy introduced the term "balanced anesthesia" to describe using a combination of agents and techniques such as premedicants, regional anesthesia, and one or more general anesthetic agents to produce the desired pain relief and anesthesia and to avoid overdose with one single agent. Dr. Lundy's idea was to be repeated in his writings later in his career. With this concept, he was prophesizing the modern administration of anesthetics, which involves using small doses of multiple drugs to produce specific desired effects.

### ***Intravenous Barbiturate Anesthesia***

Dr. Lundy and his associates at the Mayo Clinic probably will be best remembered for the part they had in the introduction of intravenously administered barbiturates into anesthesia. Barbitone was first synthesized by Emil Fischer (1852-1929) and Baron Josef von Mehring (1849-1908) in 1903. Various medium- and short-acting barbiturates became available in the 1920s and

early 1930s. In 1929, Lundy and his colleagues began to experiment with several of the barbiturates to examine whether they could be used as intravenous anesthetics. The first tested agent, sodium amytal, produced anesthesia, but its recovery time was too long to make it a useful agent. In 1930, sodium pentobarbital (Nembutal) was tested. Even though it required a smaller dose than did sodium amytal, recovery time associated with its use was still long. In 1932, hexobarbital (Evipal) was introduced into clinical medicine. This agent was the first ultra-short-acting barbiturate available. When examined by Dr. Lundy and his colleagues, hexobarbital was found to produce a pleasant sleep and have a fast recovery time but no muscle relaxation. They concluded that this agent still was not the ideal intravenous anesthetic.

Dr. Lundy deserves credit for recognizing that sodium pentothal, when it became available, was superior to all these other agents. In the beginning of 1934, Abbott Laboratories supplied him with two short-acting barbiturates, sodium pentothal (# 8064) and thiosebutal (# 8076) for clinical trials. During these trials, Dr. Lundy frequently corresponded with Dr. E. H. Volwiler (1893-1992), vice president in charge of research at Abbott Laboratories. On January 18, 1935, Dr. Volwiler, still not convinced that sodium pentothal was useful and concerned about the potential problems with the patent on this drug in several foreign countries, suggested to Dr. Lundy,

...We are busily engaged in preparing somewhat larger quantities of # 8064 and # 8076 so that the clinical trial may be expanded as much as may appear to be desirable. In view of the fact that the use of the very short-acting barbiturates intravenously is still quite new and the use of # 8064 and # 8076 is newer still, would it not be best to assemble a very considerable number of cases before publishing hereon?...Another factor in this connection is that a patent application was filed less than a year ago, and several foreign patents will also be applied for. Until the patent situation becomes somewhat clarified, perhaps it is just as well that no publications about the product have appeared...

By April, 1935, Dr. Lundy had become convinced that sodium pentothal was safe and was the intravenous anesthetic agent of choice. He wrote to Dr. Biehn, director of clinical research at Abbott Laboratories, telling him that he would present a talk on April 10, 1935, to the staff of the Mayo Clinic, describing his experience with sodium pentothal. In his letter, Dr. Lundy stated that the *Proceedings of the Staff Meetings of the Mayo Clinic* would publish a report of his presentation. He described his enthusiasm about sodium pentothal:

...The outstanding advantages of sodium ethyl-1-methyl butyl-thiobarbituric acid over both barbituric acid derivatives that I have used is the better relaxation produced by it without loss if its other valuable characteristics of quick induction; quiet breathing; no increase in blood pressure; absence of sweating, nausea and vomiting; quiet recovery; and based on my experience to date, with little escharotic action when injected outside the vein especially in dilutions of about 10 percent.

Abbott Laboratories refused to supply sodium pentothal to other anesthesiologists at this time. For example, when Dr. Steven E. Williams from Chippewa Falls in Wisconsin requested samples of #8064, he was informed by Dr. Biehn that it is: ...furnished to Dr. Lundy with the express agreement that he is to make the first report in the literature on this product, if and when it is finally marketed, this being his sole recompense.

This letter supports Dr. Lundy's claim that he was the first to test and use sodium pentothal clinically. According to Dr. Lundy, Dr. Tatum, a pharmacologist at the University of Wisconsin in Madison, was to study the pharmacologic effects of sodium pentothal, while he tested the clinical effects on patients. Apparently, Dr. Tatum agreed to publish his results first, after which Dr. Lundy would follow with his publication of his clinical experiences on the use of the drug. This sequence was not the way the events subsequently unfolded. Dr. Tatum gave Dr. Ralph Waters some of his sodium pentothal, who administered it to a few patients and was not impressed by it as an anesthetic. These superficial preliminary clinical studies were included in Dr. Tatum's publication. Being thus preempted, Dr. Lundy was upset because he believed it broke their agreement. Their correspondence at the time could not be located, but it was probably not very friendly. Dr. Biehn's writing to Dr. Lundy on October 16, 1935, says:

...Dr. Tatum has apparently crossed you off his list for now and henceforth to the end of the earth. As I understand it, because of the fact that you did not mention his work when he and Waters did the pharmacology on # 8064, in your report, which appeared in the *Proceedings of the Staff Meetings of the Mayo Clinic*, August 21. I believe that the paper by Tatum and Waters will appear sometime soon in the *American Journal of Surgery*...

Dr. Lundy replied on October 21:

Can you tell me how I could have found out about Tatum's article? As I recall it, Tatum did not mention my article on Nembutal when he published his, and it looks like a horse a piece to me.

In any event, the description by Dr. Waters and his colleagues at Madison superseded Dr. Lundy's description of his first use. Dr. Lundy's report was, at the time, more influential, probably

because of his previously reported work with Dr. Ralph Tovell in their use of other barbiturates. Barbiturates, at that time, were used as the sole anesthetic agent. Dr. Lundy continued to be a strong advocate for the use of barbiturates throughout his career. This practice was to become criticized when many sailors, severely injured in Pearl Harbor, succumbed to the agent while they were being operated on for their injuries. In an article in *Anesthesiology*, intravenous anesthesia was then described as an ideal method of euthanasia in war surgery. Dr. Lundy's colleagues, Drs. Adams and Gray, however, were quick to demonstrate that sodium pentothal could be safely given to a patient in profound shock, implying, as stated in an accompanying editorial to their article, that the fault lay with the administration of the drug rather than with the drug itself. Subsequently, Dr. Adams wrote the classic text *Intravenous Anesthesia*, which established this method of anesthesia.

Dr. Lundy himself, continued to have a cordial relationship with Abbott Laboratories. They helped him financially when he needed it, and they arranged for a member of their auditing office to help him sort out his financial problems. Dr. James Eckman (1908-1987), a close friend of Dr. Lundy's, summarized the relationship that he had with Abbott Laboratories, to Dr. Lundy's daughter in May 1974:

Most assuredly, your father was a consultant to the Abbott Laboratories of North Chicago, Illinois . . . When I used to go to the Abbott Laboratories with your father, he was received as if he were a visiting potentate from abroad. I don't know that he had a formal contract as a consultant to Abbott Laboratories, but he certainly was a consultant to them...

### **Blood Preservation and Blood Banking**

Another major contribution made by the section on anesthesia to the practice of medicine was its work on blood preservation. Carl Landsteiner had described the ABO blood group system in 1900, but the rhesus monkey factor (Rh) remained undiscovered until 1940. Ten years after Landsteiner's report, studies were published on the successful administration of blood from one person to another. This report was particularly important during wartime. Anesthetists were involved in this activity with their focus being not only to keep patients anesthetized but also to prevent shock and to protect the body from injury. In 1933, the physician anesthetists at St. Marys Hospital began to supervise blood transfusions in children, and during the next year the section also assumed responsibility for this activity in adults. For a blood transfusion, the donor had to be present, because only fresh blood could

be transfused into the patient. This procedure was inconvenient and impractical and led to experiments trying to preserve blood, so that it would be available at all times. By this time, sodium citrate had been found to be an effective anticoagulant. Dr. Lundy and his colleagues discovered that anticoagulated blood could be stored by cooling it. In the *Proceedings of the Staff Meetings of the Mayo Clinic*, Volume 11, 1936, he wrote:

In 1935, we frequently kept citrated blood in the ice box for as long as fourteen days and found that it could be administered satisfactorily with the usual benefits accruing to the patient and without an undue incidence of untoward reaction. In this way, we were able to draw from a donor the blood that we might wish to administer subsequently in divided doses and in small quantities. Thus we escape the necessity of calling the donor each time a transfusion of a small amount of blood is undertaken. This practice also permits the keeping of blood from a universal donor on hand in anticipation of an emergency when immediate transfusion is essential.

These important findings were to have far-reaching consequences. It appears that the Mayo Clinic was the first institution in the United States to introduce blood preservation, and the Cook County Hospital in Chicago was the first (1935) to introduce organized blood banking in this country. Because of its interest and contributions to blood banking, the section on anesthesia remained responsible for blood transfusions and blood banking at the Mayo Clinic for many years. Drs. Seldon, Charles C. Restall (1923-1994), Stephen M. Brzica (1945- ), and Ronald J. Faust (1944 - ), all members of the department, contributed to this field in its subsequent development.

### **Innovations in Anesthetic Equipment**

Reference has already been made to the fact that Dr. Lundy himself was a tinkerer, always attempting to design new pieces of equipment or improve existing equipment to help facilitate the administration of anesthetics. His colleagues were also active in this endeavor. In 1936, Dr. Tovell described, in an article in the *Proceedings of the Staff Meetings of the Mayo Clinic*, a new type of cuffed nasal endotracheal tube. Such cuffed endotracheal tubes were required to make the anesthetic breathing circuit airtight, a necessity when a closed-breathing system was used with carbon dioxide absorption—a procedure pioneered by Dr. Waters. To solve this problem, Drs. Waters and Guedel developed an endotracheal tube with an inflatable cuff. This tube was useful for oral intubation but was too bulky for nasal intubations, the preferred means of access to the airway in those days before muscle relaxants. Dr. Tovell modified the cuff so that in its deflated



Fig. 17. Florence McQuillen was a prominent nurse anesthetist at the Mayo Clinic. She, together with Dr. Lundy, published from 1937 to 1966 *Anesthesia Abstracts*, and she prepared abstracts for *Anesthesiology* until 1947. She resigned from the Mayo Clinic in 1948 to become executive secretary of the American Association of Nurse Anesthetists.

state it was closely applied to the outer wall of the endotracheal tube. This change permitted the tube to be less bulky and easier to insert blindly by the nasal route.

Dr. Woodbridge designed another type of endotracheal tube, namely an armored one, which could not be inadvertently obstructed by being kinked. He also participated in introducing the intercoulper, a device that reduced the risk of explosion of inflammable agents by electrical sparks.

In 1945, Dr. Tuohy, while at the Mayo Clinic, introduced his technique for continuous spinal anesthesia. Before this time, the technique was feasible only with malleable spinal needles, which were left in-situ for the duration of the block. Dr. Tuohy's technique was to pass a small catheter, originally designed to cannulate the ureter, through a spinal needle with a specially modified angulated point, which served to guide the catheter into the subarachnoid space. Once the catheter was so placed the needle could be removed. The needle could also be used to place catheters in the extradural space, an application for which it still finds everyday use at the present time.

In 1950, Dr. David Massa, a fellow in anesthesiology, published a short but important paper in

the *Proceedings of the Staff Meetings of the Mayo Clinic* describing the construction of the first modern plastic needle. A flexible, plastic, thin-walled tube was attached at one end to a metal hub and tapered at the other end and then a steel needle was passed through the hub and tubing to act as a stylet (Fig. 16). Until this time, flexible tubing could be inserted only into a vein through a steel needle already in place. Dr. Massa's needle continued to be manufactured by the Rochester Product Company for many years thereafter.

#### **Postanesthetic Recovery Rooms**

On March 17, 1942, members of the anesthesia section opened a post-anesthesia recovery room (PAR) at St. Marys Hospital and Dr. Lundy wrote a paper describing this. The PAR had the virtue of allowing anesthetists to closely supervise patients immediately after surgery, as they recovered from the effects of the anesthetic. Almost a century earlier, Florence Nightingale (1820-1910) advocated setting aside an area for patients after surgery. However, the publication by Lundy describing the unit at St. Marys Hospital was the real impetus to establishing these units in the United States and then subsequently abroad.

#### **Educational Texts**

In the late 1920s, the section initiated a journal club, which included residents, nurse anesthetists, and staff and met weekly. Florence McQuillen (1903-1981) (Fig. 17), a nurse anesthetist who administered anesthetics to patients operated on by the Mayo brothers, and Dr. Mousel, a resident, were given the responsibility of finding appropriate papers for discussion. From its inception, the journal club was unpopular, with people resenting the time required to review papers and prepare reports. Florence McQuillen suggested to Dr. Lundy that distributing abstracts of the papers to be discussed to club participants before its meeting might create more interest in the club. This suggestion prompted Dr. Lundy to arrange, with the section of publication of the Mayo Clinic, to have these abstracts published from 1937 onwards under the title *Anesthesia Abstracts*. For many years, the publication was successful and only ceased publication in 1966, when its sales declined after the introduction of a rival publication, *Survey of Anesthesiology*.

Florence McQuillen also prepared abstracts for publication in the journal *Anesthesiology* when it started its publication in 1940 and continued doing this until 1947, when she became disenchanted with the relationship between nurse anesthetists and anesthesiologists in the United States but not at the Mayo Clinic! On June 4,

1947, she informed Dr. Henry S. Ruth (1899-1956), editor-in-chief of *Anesthesiology*, about her decision. She wrote:

...When Anesthesiology first appeared I was willing even anxious, to help out because, at that time I thought that a tangible contribution by a nurse anesthetists to the physician anesthetist effort might help to co-ordinate and consolidate mutual understanding. You and Dr. Lundy have always been gentleman in your dealings with me and as far as I know with other nurses. This is not true of many physician anesthetists... As the situation progresses I feel that no such effort as my eight years of contributing to the abstract section of your Journal will accomplish what I had hoped. Therefore, I decided that I would no longer spend hours of time with the resulting wear and tear on my nervous system in so futile an effort ...

Florence McQuillen resigned from the Mayo Clinic in 1948 to become the executive secretary of the American Association of Nurse Anesthetists.

In 1942, Lundy published his textbook *Clinical Anesthesia*. It was one of the first authoritative textbooks to describe modern anesthetic practice and was widely used during the last half of World War II (1939-1945) by medical officers in the United States armed forces and civilian anesthesiologists.

## 6. Dr. Lundy and the Anesthetic Community at Large

### *Dr. Lundy's Concept of an Anesthetic Department*

From the beginning of his tenure as head of the section on anesthesia at the Mayo Clinic, Dr. Lundy had a clear concept about organizing and directing a modern academic department of anesthesia. Frequently, hospital administrators, deans and others sought his advice on how they should proceed to organize such departments. Dr. Lundy never hesitated to provide a clear vision of his ideas, even though they were often not popular with surgeons and hospital administrators. For example, in 1927, Dr. Ralph Seem, director of University Hospitals at the University of Chicago, made such an inquiry and Dr. Lundy replied:

The personnel of the Department of Anesthesia should be made up of persons capable of administering general, local, or regional anesthetics. At first, one person in the department whose experience covers both fields would probably be sufficient. This person should, of course, be able to teach assistants and build up a capable and permanent staff. The demand for persons trained in the technic for administering all types of anesthetics has just begun. In a hospital such as yours, the head of the department would find opportunity to give courses in anesthesia to

physicians, dentists and student nurses. It has been the experience in the Mayo Clinic, as well as in other institutions, that nurses are splendid technicians, but they are not productive in the way of bringing out new anesthetic agents, new methods of administration, or new kinds of equipment. Recently, the University of Wisconsin appointed Dr. Ralph Waters of Kansas City, Missouri, as head of their department of anesthesia. Dr. Waters, competent in general anesthesia, spent three months at the Mayo Clinic last summer studying regional anesthesia. . .

### *Anesthetists' Travel Club*

At the end of 1928, Dr. Lundy began contemplating organizing a meeting of leading anesthetists in the United States and Canada to discuss problems pertaining to their specialty. He wanted to invite only anesthetists who were interested in advancing the specialty. During the planning stages, Dr. Lundy corresponded frequently with many of his friends and asked for their advice. For instance on November 5, 1928, Dr. Lundy explained his goals for such a meeting to Dr. Lincoln F. Sise, the chief anesthetist of the Lahey Clinic in Boston, Massachusetts.

I have in mind an educational idea, which I have been thinking about for three years. I would like your opinion on this subject. I am not satisfied with the results obtained by the present day Societies of Anesthesia. As it is, one scarcely needs to improve his method and technic to become a member of such an organization.

I want a society to which we will be proud to belong, as after the charter members have been selected we would admit no one of whom we would not be proud.

Dr. Guedel responding to a letter from Dr. Lundy encouraged him to proceed with the meeting. He wrote in a letter from November 4, 1929:

If you are as good a picker as I think you are, I can see great things resulting from the kind of meeting that you are arranging. Anesthesia needs something like that now, and needs it badly. I am glad you are taking the initiative and that you have the facilities necessary to put it over.

Am I coming? Yes if I can possibly do it. Finances are low and Rochester is a long way off. However, I might sell my house by that time and if so, I will be with you. I appreciate the compliment of your invitation . . .

Let me hear of any further developments about your meeting. I am mightily interested in the good that can come from it...

The first meeting of the Anesthetists' Travel Club was held in Rochester, Minnesota, from December 16-21, 1929. Twelve eminent anesthesiologists from the United States and Canada participated, including Drs. Guedel, Sise, and Waters.

Both Drs. Will and Charlie were present at the opening of the meeting and made speeches. The presentations were printed in two supplements

to the *Proceedings of the Staff Meetings of the Mayo Clinic*, the first and only ever to be published. Dr. Will's comments began:

I am sure I can't add anything to what Charlie has said. I remember the incidence of which he speaks and can see him in my mind's eye, a small boy of twelve in knee pants, standing on the chair and dropping the chloroform on. Before closing this very interesting discussion, I would like to say that we are glad to have the anesthetists here and see anesthesia passing into the hands of trained women and men who are making good progress because of the research brought to bear on the subject.

Six years ago, in January, I was going to Australia and New Zealand and I stopped in Seattle to attend a medical meeting and a banquet for several hundred persons. Across the table from me, sat a young and handsome man who interested me immediately in his talk about anesthesia. When the meeting was over, I asked him to walk to the station with me as I was taking the train to Vancouver. He said he thought research ought to be done in anesthesia. He was not situated so that he could do research. I asked him how he would like to come to Rochester, and he said he would like nothing better. Before I left, I made arrangements for him to come to Rochester, and when I returned from Australia, he was here. Since then, the section of anesthesia in the clinic has been in the hands of Dr. Lundy. He has not only done remarkable research himself, but has encouraged other men to see what can be done and what we can expect of research in anesthesia.

Dr. Lundy had carefully planned for the meeting and left nothing to chance. He was going to use it to introduce his Mayo Clinic colleagues and to demonstrate his own prowess.

On Monday, December 16, 1929, the anesthetic effects of four types of alcohols were tested. Rabbits were injected intravenously with methyl-, ethyl-, propyl-, or butyl alcohol and one rabbit received tribromoethanol (Avertin) intravenously. The responses of the animals to these injections and their recovery were closely monitored. In the physiology laboratory, Dr. Markowitz (1860-1925) from the Mayo Clinic demonstrated a preparation of an isolated perfused heart. The blood was prevented from clotting by the use of heparin. He demonstrated that stimulation of the vagus nerve in a dog produced a substance, which when injected into another heart caused it to stop.

On Tuesday, December 17, 1929, mice and guinea pigs were anesthetized with cyclopropane, propylene, butylene, or amylene. These gases had been obtained from the Ohio Chemical and Manufacturing Company in Cleveland. The animals inhaled various concentrations of the gases and their responses were observed. All animals survived and were fully awake in less than 8 min-

utes. Dr. Isenberger from the Mayo Clinic showed the assembled company how injecting cocaine into the dog caused convulsions. He wanted to demonstrate that the convulsions could be stopped by an injection of sodium amytal. Unfortunately, the dog collapsed before the sodium amytal could be administered.

On Thursday, December 19, 1929, Dr. Lundy took the group to St. Marys Hospital and demonstrated the rectal administration of Avertin.

The meeting was judged to be a great success. Reporting to Mr. Scholes of the Ohio Chemical and Manufacturing Company, Dr. Lundy stated:

...The entire group was very much impressed with the gases you sent us and the results obtained from them. We tried all the products you sent on the guinea pigs and mice and were fortunate to lose no animal after having produced anesthesia with each of these agents. We thought cyclopropane was much better than any of the others from the standpoint of anesthesia...

Only 6 months before in July 1929 in a letter to Dr. Lundy, Dr. Waters confessed how little he knew about cyclopropane. Five years later, he and his colleagues in Madison, Wisconsin, published a paper reporting their use of cyclopropane to anesthetize patients. It is interesting to speculate whether the demonstration in Rochester persuaded Dr. Waters to initiate these clinical studies on this anesthetic agent.

The Anesthetists' Travel Club met again in Rochester in 1933 and 1938 (Fig. 18). Because of World War II meetings were not held between



Fig. 18. Members of the Anesthetists' Travel Club at the meeting in 1938 in Rochester, Minnesota. Standing from left to right: Drs. Ralph M. Tovell, Harold R. Griffith, Arthur E. Guedel, Harry J. Shields, Paul M. Wood, Philip D. Woodbridge, and T. D. Buchanan. Seated from left to right: Drs. Henry S. Ruth, W. Easson Brown, Brian Sword, John S. Lundy, Ralph M. Waters, Charles H. Robson, J. A. Blezard, and Robert D. Hammond.

1942 and 1951. In 1952, the last meeting of this club was held in Rochester, at which time the club was disbanded and replaced by the Academy of Anesthesiology, which elected Dr. Lundy as its first president.

### ***The Role of Dr. Lundy in Founding the American Board of Anesthesiology***

Dr. Lundy and his colleagues at the Mayo Clinic contributed significantly to the development and recognition of anesthesiology as a specialty in its own right. Dr. Lundy's early interest in having anesthesia recognized as a specialty was summarized by him in 1968:

In those early years, I felt as if I were garbed in Joseph's coat of many colors. I was anxious to join some organization in which a physician like myself, with my primary interest in everything pertaining to anesthesia, might take part in a relationship which would be of mutual benefit to society, to physicians, and surgeons and especially to patients. I therefore applied to the American College of Surgeons, since every member of that organization had a basic concern with anesthesia, but the College refused to consider me for membership, because I was not a surgeon. I then applied to the American College of Physicians, which straightaway gave me the same reception. I thus remained suspended in a medical limbo... But since I never became known for indecision or abnegation, I set about to heat up the fire and see what rare distillation I could brew...

In April 1929, Dr. Lundy received a letter from Dr. Olin West, secretary and general manager of the American Medical Association (AMA) inviting him to serve on a committee to study anesthesia accidents. Dr. Lundy forwarded the letter to Drs. Charlie and Will, requesting their advice as to whether to accept this invitation. Dr. Charlie scribbled on the letter "fine" and Dr. Will, "go ahead with it." So doing, Dr. Lundy used the contact with Dr. Olin West, then an important figure in the AMA, to further the cause of anesthesia as a specialty. From then on, whenever he was in Chicago at the AMA, Dr. Lundy visited Dr. West and never failed to impress upon him that something should be done to raise the professional standards of anesthetists and give professional recognition to their specialty.

While Dr. Lundy was pursuing this goal with Dr. West, Drs. Ralph Waters and Paul Wood (1897-1963), in 1933, began their exploration into the issues that would need to be addressed to enable the New York Society of Anesthetists to create a national fellowship certification of anesthetists in accordance with the standards of the American Board of Medical Specialists and in collaboration with the AMA, which sponsored these boards. They concluded that certification would

entail several steps. The first step required defining the training required to be a fellow of this proposed body, and they suggested that an applicant would have to present evidence that he or she had administered 2,500 anesthetics and be a member of the AMA in good standing and pass written, oral, and practical examinations. Drs. Wood, Waters, and Lundy also had to demonstrate to the AMA that the main society of anesthetists, namely the New York Society of Anesthetists, represented national rather than regional interests. After considerable discussion, the New York Society of Anesthetists was so persuaded and changed its name to the American Society of Anesthetists in February 1936. This body was subsequently to change its name to the American Society of Anesthesiologists in 1945.

Drs. Lundy, Wood, Waters, and others then attempted to find a board to judge the professional competence of anesthetists in the AMA section on pharmacology and therapeutics. They failed in this effort. Fortunately, Dr. Erwin Schmidt, head of surgery at the University of Wisconsin and a colleague of Dr. Waters, offered his help. He suggested that a board of anesthesia could be recognized by the AMA as a sub-board of the American Board of Surgery. The anesthetists enthusiastically endorsed this proposal. In 1938, the American Board of Anesthetists came into existence as an affiliate of the American Board of Surgery. Only after the death of Dr. Francis McMechan, editor-in-chief of *Anesthesia and Analgesia* and an important opponent to certification of anesthetists by the AMA, could Dr. Lundy convince Dr. West and the AMA leadership that anesthesia should have its own section within the AMA and that its board should be independent of the American Board of Surgery. The House of Delegates of the AMA in 1940 approved a resolution that a section on anesthesia be so formed. Dr. Lundy was appointed secretary of this section, a position he held for 17 years.

### ***Dr. Lundy's Role in the Birth of the Journal Anesthesiology***

Simultaneously with the difficult task of persuading the AMA to create a section on anesthesia, Dr. Lundy became involved in discussions to create, for the American Society of Anesthetists, an anesthesia scientific journal to compete with the journal *Anesthesia and Analgesia* edited by Dr. Francis McMechan. Dr. Paul Woods of the American Society of Anesthetists led this effort, and he and Dr. Lundy corresponded frequently about it. They sought to examine the merits and mechanisms to establish this new journal. Of course, Dr. McMechan did not relish the thought

of a second journal on anesthesia. In a letter to Dr. Paul Wood he offered:

...to again invite the American Society of Anesthetists to publish the papers of their meeting in Current Researches of Anesthesia and Analgesia to make them available to all the Anesthetists in International Anesthesia and preserve them as part of the printed literature of the Specialty... We would be prepared to begin their publication in our July-August issue as our publication schedule has already been made up to that issue. Our one regret is that space could not be made available for printing the discussions of these papers.

As practically all the Members of the American Society of Anesthetists are subscribers to our journal the arrangement suggested would not involve them in any additional expenses. In fact it would conserve a large amount of Society funds now used for mimeographed transactions for other useful purposes.

We hope this invitation will receive the Society's friendly consideration and we look forward to an early and favorable reply.

But Dr. Wood rejected these ideas on several grounds. In a letter to Dr. Lundy, he said diplomatically:

I have received a letter from McMechan, copy of which is enclosed. I do not feel like accepting McMechan's very gracious offer even for the sake of harmony because first, the object of our minutes is to get them out at the earliest possible moment after they have been delivered. This gives other investigators an opportunity to know what is going on at the time - not six months or a year later. Secondly, he would not have room for the discussions. I have many indications pointing to the conclusion that the discussion is the more valuable portion to most of our readers. Third, we have always suggested to authors that if they did not care to publish their item in any journal of their own choice, that we would endeavor to have it published in the American Journal of Surgery or Anesthesia and Analgesia, and Mac has frequently accommodated us accordingly. So far as that portion of his request is concerned, I have already informed him that our mimeographed minutes are not a publication and that papers read before the Society may be published in any journal according to the desire and ability of the author to have such work accepted.

Dr. Wood did not want Dr. McMechan to be the editor of papers presented at the American Society of Anesthetists. He wanted another journal.

Dr. Lundy again used his connections to the AMA. On January 5, 1938, he wrote and asked Dr. Morris Fishbein (1889-1976), editor of the *Journal of the American Medical Association* for advice:

I had a communication from Mr. Charles C. Thomas, publisher, asking to be considered as publisher for the journal on anesthesia by the American Society of Anesthetists, if such a journal is to be published. As you know, I favor the

publication of a new journal on anesthesia in this country and my vote on the question would be "yes" to the question of a new journal, but I do not know what to do about the question of whether the Thomas Company should publish it. I should like your opinion and would be glad to keep it confidential if you wish as to whether you would recommend the publication of a new journal on anesthesia and whether you would consider the Thomas company a proper one to publish it.

Much correspondence between the American Society of Anesthetists (ASA) and Charles C. Thomas, Publisher, eventually occurred, but no agreement could be reached. By the middle of 1938, it was decided that the American Society of Anesthetists should publish the journal itself. Dr. Wood wrote to Dr. Lundy:

By way of getting more concrete replies to our questions about the Journal, would your Department of Anesthesia be prepared to give us at least two scientific papers per year for the proposed journal of the American Society of Anesthetists?

I fully realize that many more papers would be necessary but if we could secure a definite promise of a minimum number per year from the recognized research centers, it would be of great assistance. Also, your own personal ideas as to the form, size, and general contents of the magazine together with any other research men or teachers whose authorship or editorship in such an undertaking should be considered.

I will get in touch with Tuohy directly to see his reaction to acting as Editor. I have already sounded out men from various sections of the country and as you so well know there is always some peculiar reaction to one place or another. I have had several unfavorable comments on the Mayo Clinic editing of the proposed magazine. Even if it were published in Jerusalem by the Lord himself, I think some would object. Nevertheless, I like the set-up, which we have discussed rather briefly with Tuohy taking charge at first. If such a proposition did not work out, it could be very quickly changed.

Dr. Lundy responded promptly. He wanted the editor of this new journal to be a member of his section on anesthesia at the Mayo Clinic. Indeed, he offered to be the editor-in-chief himself.

In answer to your letter concerning the proposed journal, I can promise at least two scientific papers from our department each year. I think the journal should be a quarterly at the beginning, and I think it should contain at least four or more good articles or the equivalent in shorter articles and the journal should hold itself to that minimum and grow to whatever capacity the future holds for it. Of course it should be edited carefully and it should carry whatever reputable advertising it can obtain and should be the property of the American Society of Anesthetists. Every effort should be made to avoid the establishment of another poor journal on anesthesia, and if it cannot be a good journal and a credit to the Society it should not be attempted, even

though it might be a commercial success, which I think it will be. As I have told you before, I have gone over in my mind all who would be willing to do the work in connection with the journal, and the only man I know who is willing, who has the facilities, and who could do the work as it should be done is Ed Tuohy. If the objection is so very great to his doing it, I should be willing to take it over at the start.

About 1 year later in 1939, Dr. Lundy changed his mind but continued to push for the editorship to be in Rochester:

In regard to the publication of a journal, I am beginning to feel that it might be best if the journal were not in the hands of the American Society or any other society, but that it might be worthwhile to have it sponsored by the American Board of Anesthesiology. If this were the case, there would be no question about it being financially successful because it would almost be essential for all of its supporters to take the journal, especially those who wish to prepare themselves for examination.

I have written Dr. Ralph Waters to see how he feels about it. I met Dr. Fishbein, who was down for Dr. Will's funeral Sunday, and he for the first time talked as though it would be a very simple matter to have a journal published by the American Medical Association. If so, I think we had better make some move in that direction... Should the journal be published in Chicago, it probably would be very convenient to have the editor in the Middle West...

Whether Dr. Lundy was motivated by his interest in having the editorship of the new journal be based in Rochester or a desire to maintain good relations with the AMA is not known. In either event, Dr. Waters disagreed politely with Dr. Lundy. In a letter from August 4, 1939, to Dr. Lundy, he expressed his thoughts about a journal:

...Now from the standpoint of conduct of such a magazine, I believe it can be kept in the hands of the A.S.A. with advantage and possibly with profit to the Society. That is, I feel that the subscription to the journal should be included in the dues of the Society and that it should not be turned over to the A. M. A. I have made some inquiries in regard to the bacteriologists, the physiologists, the pharmacologists and others who publish such journals. The conduct of their journals has seemed to them satisfactory in every case...These ideas are the accumulation of considerable thought about the matter and considerable inquiry from members of other groups, and as I see it now, are fairly sound...

Dr. Water's thoughts were indeed sound, and they were accepted by the ASA. On November 6, 1939, Dr. Ruth informed Dr. Lundy that the journal and publication committee of the American Society of Anesthetists had agreed on a slate for the line-up of the editorial board of the new journal. The editor-in-chief was to be Dr. Ruth from Philadelphia. The two associate editors were Drs. Tovell and Rovenstine. The slate also named

15 editorial board members, including Drs. Lundy, Woodbridge and McCuskey, current or former anesthetists at the Mayo Clinic. In July 1940, the first number of the first volume of *Anesthesiology* was published by the ASA.

#### **Dr. Lundy and Dr. Waters**

Dr. Lundy, based in Rochester, and Dr. Waters, based in Madison, had a long and productive professional relationship. In many respects, Dr. Waters was the antithesis of Dr. Lundy, with Dr. Waters being the thinker and Dr. Lundy the organizer and promoter. They did not always agree with each other. Dr. Waters believed in inhalation anesthesia, whereas Dr. Lundy promoted intravenous anesthesia and regional blocks. Nonetheless, they always showed each other mutual respect, and as evidence of this, they encouraged their trainees to visit each other's department.

The use of sodium pentothal and carbon dioxide was a particular source of disagreement between Dr. Lundy and Dr. Waters. Together at an ASA meeting, when sodium pentothal use was being questioned and Dr. Lundy was asked what was a minimal age a child should be before receiving sodium pentothal, Dr. Lundy replied that he would not use that drug for children less than 10 years of age. Dr. Waters then stood up and remarked that he did not think that sodium pentothal should be given to anyone less than 100 years of age. On this issue, Dr. Lundy's view has prevailed. Dr. Waters, who perfected the carbon dioxide absorption system, was correct in his objection to deliberately adding this gas to the inspired gas mixture during anesthesia. On August 2, 1927, Dr. Waters wrote to Dr. Lundy about this subject:

I too am impressed about the value of having carbon dioxide available, there is no doubt about that, but what I know about the darn stuff is very little. If carbon dioxide added from a tank has an advantage over properly conducted rebreathing, why is this? Do you feel there is any possibility of causing trouble by a rise in blood pressure accompanying such use of carbon dioxide, or do you feel that such use of carbon dioxide does not result in a rise in systolic pressure? As soon as possible, I wish to come over with the express purpose of getting it through my thick head the exact slant you have on this subject. I am free to admit that I am still considerably up in the air as to what I know and what I don't know about the physiology of carbonic acid gas. The two things that seem definite to me now are that clotting time is reduced when the quantity of carbon dioxide in the circulating blood is in excess and this seems to have possibilities of practical use. And secondly, that it is a most valuable drug in cases of extreme respiratory depression. Further that I am still quite up in

the air. Sometimes I think I know something and sometimes I think I don't ...

### **Dr. Lundy and Dr. Guedel**

In October 1927, Dr. Guedel decided to work for a period with Dr. Waters, and thereafter, with Dr. Lundy, from whom he wanted to learn more about regional block techniques. During his visit to Rochester, Drs. Guedel and Lundy became good friends, and they continued to correspond frequently and regularly throughout their careers. Dr. Guedel was a warm, kind, and knowledgeable gentleman.

In 1928, Dr. Guedel and Waters designed an endotracheal tube with an inflatable cuff to permit an airtight breathing system. Dr. Guedel recognized that this tube would be of value not only in the care of anesthetized patients but also in the need for mechanical ventilatory support for other reasons. He invited Dr. Lundy to co-author an exhibition at an AMA meeting, where he intended to demonstrate the use of the cuffed endotracheal tube by ventilating isolated dog lungs using the respirator developed by Dr. Lundy. He described the exhibition he had in mind to Dr. Lundy:

...Here is the picture. Glass jar sufficiently large to accommodate the lungs easily, filled with water, lungs held to the bottom of the jar by weights-upright position — larynx intubated with our catheter and your respirator working, just outside the jar with tube connected to our catheter. The whole business from the catheter down to be underwater.

It strikes me that such a show would attract a lot of attention and explain some practical applications of the combination of your respirator and our catheter. For example- unconscious morphine poisoning, apnoeic. Could introduce our tracheal plug, hook up your machine and start it, then go to dinner.

Dr. Lundy wanted to participate in this exhibition, but the chairman of the committee on education and research at the Mayo Clinic, Dr. H. F. Helmholtz, denied this, stating:

The Committee feels that it is inadvisable to do this.

This recommendation was unfortunate and shortsighted. Dr. Guedel's vision of intubating the trachea with a cuffed endotracheal tube and applying mechanical ventilation to the lungs was far ahead of its time and is currently in common practice in all operating rooms and intensive care units throughout the world.

### **The Character of Dr. Lundy, the Man**

Dr. Lundy was clearly a forceful, indomitable figure not distracted by adversity or roadblocks created by established rules of the game. There are many anecdotes about him, which give insights into his character. A couple were quoted

by Dr. Eckman concerning his acknowledged skill at inserting needles:

Once when the distinguished surgeon Dr. Hallenbeck was a fellow at the Mayo Clinic, he and some of the pediatric fellows were trying to emplace a needle in the vein of an infant, who they judged needed intravenous feeding. After a number of failed attempts, they decided to call Dr. Lundy. He came in, found the vein, placed the needle in an instant, and he walked out and strode down the corridor towards the operating rooms.

One of the young pediatric fellows was nettled by this virtuoso performance, and resolved to dampen Dr. Lundy's serene composure. He ran to the door and shouted down the corridor at the retreating form: "Dr. Lundy? The solution is not running into the vein!" Dr. Lundy continued his measured pace down the corridor, but half-turned his face over his shoulder and said: "Open the clamp and it will."

The other story concerned Dr. Lundy when he was visiting the Walter Reed Army Medical Center in Washington D.C. during World War II in his capacity as a civilian consultant to the surgeon general of the army. Demonstrating venipuncture to an audience of physicians, one army physician who later became a world-famous surgeon, questioned Dr. Lundy on the positioning of the patient. Dr. Lundy turned to this officer and growled:

After thirty years in intravenous techniques, I do not propose to take instruction from some sod-buster just conscripted into the Army.

The other members of the audience, mostly physicians recently inducted into the army, were apparently delighted by this response.

One of the great enjoyments in life for Dr. Lundy was entertaining guests. Both he and his wife had a reputation that they could handle alcohol, but he never missed a day of work because of a drinking problem. He himself once remarked to a visiting physician at St. Marys Hospital:

Here in this room I have Dr. Alfred W. Adson, in this room works Dr. Stuart W. Harrington, over there operates Dr. Waltman Walters, and here is Dr. Claude F. Dixon, and then people wonder why I drink.

Dr. Ralph Walters once wrote to Dr. Lundy after a meeting in Minneapolis:

I am just beginning to recover from the entertainment and pleasures of the Minneapolis meeting. You Minnesota folks do surely entertain to excess. I have been very much worried about the health of the little lady who lived in Minneapolis, and helped so zealously to entertain us. I cannot remember her name. Please let me know if she survived...

During his long career, Dr. Lundy received many institutional, national and international honors. In 1934, he became a professor in the Mayo Graduate School of Medicine. In 1938, he was made an honorary member of the Societe

Francaise d'Anesthesie et d'Analgesie. In 1943, Hahnemann Medical College, Philadelphia, Pennsylvania, awarded him an honorary degree of doctor of science. The University of North Dakota bestowed the same honor on him in 1948, and simultaneously the State of North Dakota presented him with an honorary license to practice medicine in that state. Dr. Lundy served as president of the ASA in 1946, and in 1948, this

body presented him with its Distinguished Service Award. In 1968, Dr. Lundy received the Gold Medal of the Canadian Anesthetists' Association for meritorious service and the many contributions he had made to the specialty of anesthesia.

*Kai Rehder and Peter A. Southorn*



# III. History of Subspecialties

## A. Cardiothoracic Anesthesia

A strong argument can be made that the origins of cardiothoracic anesthesia can be traced indirectly to World War II (1939-1945). At that time, physiologist Dr. Earl H. Wood (1912- ) was contracted by the Army Air Corps to develop a G-suit, which would help reduce pilot loss of consciousness secondary to acceleration. For this purpose, Dr. Wood constructed the human centrifuge in Rochester, Minnesota, and was faced with the practical problem of measuring arterial pressure in test subjects. Dr. Wood had observed the use of strain gauges for testing wing strain of bombers. He modified these devices to develop strain gauge transducers for the measurement of blood pressure. In 1951, Dr. H. Jeremy C. Swan (1922- ) from Ireland joined Dr. Wood's laboratory. By 1954, Dr. Wood had developed a mobile recording assembly that allowed for the continuous, direct recording of physiologic variables. The end of World War II, the breakup of German chemical companies, and the distribution of patents to the Eastman-Kodak Company also provided Dr. Wood with access to improved dye chemistry. In collaboration with the Kodak Company, Dr. Irvin J. Fox (1926-1985) from Dr. Wood's laboratory applied the indocyanine green method for dye-dilution determination of cardiac output and demonstration and quantitation of intracardiac shunts in patients with congenital heart diseases. As Dr. Wood was developing a special diagnostic laboratory in physiology, Dr. Howard B. Burchell (1907- ) from the division of cardiovascular & internal medicine was advancing clinical cardiac diagnosis and supporting the development of cardiac catheterization resources in Rochester. With Dr. Wood's physiologic genius, Dr. Burchell's clinical acumen, the engineering innovations, and the laboratory resources and methods that were developed in the middle-to-late 1940s, Dr. Wood's group designed, tested, and applied the technology that would make open-heart surgery at the Mayo Clinic possible.

### 1. The Development of Open-Heart Surgery and Cardiopulmonary Bypass

While extracardiac thoracic procedures such as repair of coarctation of the aorta and closure of patent ductus arteriosus had been done previ-

ously at the Mayo Clinic by Dr. Oscar Theron Clagett (1908-1975), cardiothoracic anesthesia began its emergence as a sub-specialty in the late 1940s with the development of cardiac catheterization, followed by closed mitral valve surgery. The first anesthesiologist in Rochester who developed expertise in cardiothoracic anesthesia was Dr. John W. Pender (1912- ). In 1948, Dr. Pender was intimately involved in the first descriptions of circulatory physiology and the care of patients undergoing cardiac catheterization at the Mayo Clinic. In the same period, interest in developing a cardiac surgery program in Rochester sent Drs. John W. Kirklin (1917- ) and Pender to visit surgical programs in Chicago, Illinois, Baltimore, Maryland, and Philadelphia, Pennsylvania. After those visits, heart surgery began at the Mayo Clinic in January 1951, with the first closed mitral valve commissurotomy; Dr. Kirklin performed the operation and Dr. Pender administered the anesthetic. Dr. Roger W. Ridley (1918- ) later joined Dr. Pender in the care of these patients. After that, in the mid-1950s, the development of open-heart surgery and cardiopulmonary bypass resulted in the explosive growth of cardiothoracic anesthesia as a sub-specialty.

Investigators elsewhere had been working on extracorporeal circuits since the late 1930s. In August 1952, Drs. Kirklin and Wood presented to the sciences committee of the Mayo Clinic in Rochester:

...A proposal calling for the production and experimental use of a mechanical heart for certain types of cardiac surgery.

While there were previous successes in the animal laboratory, only one patient had been operated upon successfully using cardiopulmonary bypass. This was by Dr. John H. Gibbon (1903-1973) in 1953. Despite that first success, the development of total extracorporeal circulation was largely suspended in favor of the cross-circulation technique. This decision occurred because after the first clinical success, cardiopulmonary bypass had been associated with repeated fatalities. In the *cross-circulation* technique, pioneered by Dr. C. Walton Lillehei (1918-1999) and colleagues at the University of Minnesota in Minneapolis, a parent's circulation was surgically connected to that of the child. The parent's

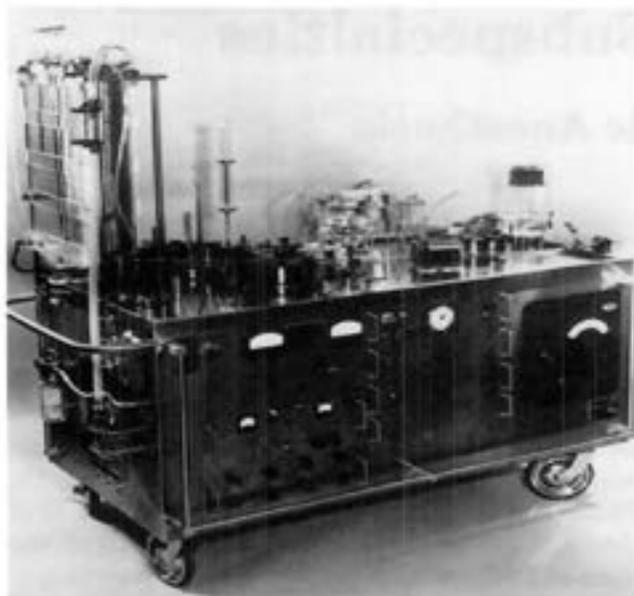


Fig. 1. The Mayo-Gibbon vertical screen heart-lung machine (circa 1955).

heart and lungs provided blood flow and oxygenation to the child during the intracardiac procedure. However, this technique was surgically, anesthetically, and logistically challenging and resulted in significant risks to two patients. So, in spite of successes with the *cross-circulation* technique in Minneapolis, Drs. Kirklin and Wood continued with their work in the development of an apparatus for extracorporeal circulation.

Using the Gibbon heart-lung machine as its starting point, Mr. E. Richard Jones (1908-1997), chairman of section of engineering at the Mayo Clinic, undertook the development of a heart-lung machine using the assistance of International Business Machines (IBM). In less than 2 years, the machine was ready for testing (Fig. 1). The machine was tested in the laboratory of Dr. Wood by the team who would use it in 1955 in the first clinical trial. That team included Drs. Robert T. Patrick (1920-1999) (Fig. 2) from the department of anesthesiology, Dr. Swan from the department of physiology, Dr. James DuShane (1912- ) from the department of pediatrics, and Dr. David E. Donald (1921- ) from the department of physiology. Their commitment and the speed of their progress were extraordinary. From the proposal to the sciences committee to the first clinical use on March 22, 1955, only 31 months had elapsed. Dr. Kirklin and colleagues reported their first clinical successes in the *Proceedings of the Staff Meetings of the Mayo Clinic* on May 8, 1955, under the title, "Intracardiac Surgery with the Aid of a

Mechanical Pump-Oxygenator System (Gibbon Type): Report of Eight Cases."

Because of the expertise he had developed in doing the animal work in Dr. Wood's laboratory, Dr. Patrick remained the anesthesiologist for every open-heart operation until January 1956, by which time the first 40 procedures had been completed. The cardiac surgical volume continued to increase through 1956 and 1957. Dr. Franklin H. Ellis (1920- ) from the department of surgery joined the open-heart surgical team and three anesthesiologists, Drs. Richard A. Theye (1923-1977), Robert A. Devloo (1913- ) and Emerson A. Moffitt (1924- ), joined the anesthesia team. Like Dr. Patrick before him, Dr. Moffitt became involved in open-heart surgery through work in the physiology laboratory, having Dr. Swan as his primary mentor. Together, Drs. Swan and Moffitt studied the hemodynamics of the next 45 patients operated upon by Dr. Kirklin. They compared the intraoperative findings with those measured preoperatively during cardiac catheterization. These investigations were instrumental in the subsequent management of cardiopulmonary bypass at the Mayo Clinic.

Until 1957, cardiac surgery was conducted in the Colonial Building of the Methodist Hospital. The move to Saint Marys Hospital was necessary



Fig. 2. Dr. Robert Patrick, who worked with Drs. Earl Wood and John Kirklin on the in-vivo testing and first clinical use of the cardiopulmonary bypass in Rochester between 1954 and 1955.



Fig. 3. Cardiac surgery at Saint Marys Hospital in the early 1960s. At the operating table are Dr. John Kirklin as surgeon and Drs. Sait Tarhan and Emerson Moffitt as anesthesiologists. Assisting are Burdette Polk, Joan Hoffman, and Robert Peterson.

because of space constraints. Cardiac surgery typically required two operating rooms, one to conduct the surgery and a second to assemble and prime the cardiopulmonary bypass machine (Fig. 3). In 1957, Dr. Dwight C. McGoon (1925-1999) joined the staff as a consultant in cardiac surgery.

A review of the publications during the seminal period of cardiac surgery in the 1950s and 1960s from the Mayo Clinic group makes the magnitude of the accomplishments evident. In addition to the surgical, technical, and engineering innovations, the safe conduct of cardiopulmonary bypass required a comprehensive characterization and application of circulatory physiology, oxygen supply, and acid-base balance (Fig. 4). The first cases of cardiopulmonary bypass employed techniques for direct blood pressure monitoring, cardiac output measurement, shunt fraction determination, blood gas analysis, and neurophysiologic assessment by EEG in surgical patients. An understanding of acid-base and electrolyte physiology, anticoagulation, and temperature management during and after extracorporeal circulation needed to be worked out, all of this occurring in patients with congenital heart diseases. The level of complexity of these cases is well reflected in comments made by Dr.

Denton A. Cooley (1920- ) about his visit in 1955 to Rochester:

...we observed John Kirklin and his impressive team in Rochester that was made up of physiologists, biochemists, cardiologists and others as they performed operations using the Mayo-Gibbon apparatus. Such a device was beyond my organizational capacity and financial reach. Thus I was deeply disappointed on our return to Houston when Dr. McNamara stated that he would not permit me to operate on his patients unless I had a Mayo-Gibbon apparatus.

Between 1955 and 1965, when the greatest strides were made in the use of cardiopulmonary bypass for cardiac surgery, Drs. Patrick, Theye, Devloo, and Moffitt and their colleagues published more than 35 papers describing the physiology and management of their patients. In these reports can be found major contributions to modern cardiac surgical and anesthetic practice.

The first reports from these pioneers were descriptions of the modified Gibbon pump-oxygenator (Mayo-Gibbon vertical screen heart-lung machine) and the rudimentary aspects of the first clinical cases. Increased experience made it possible for these reports to become increasingly more detailed, providing specifics of perfusion

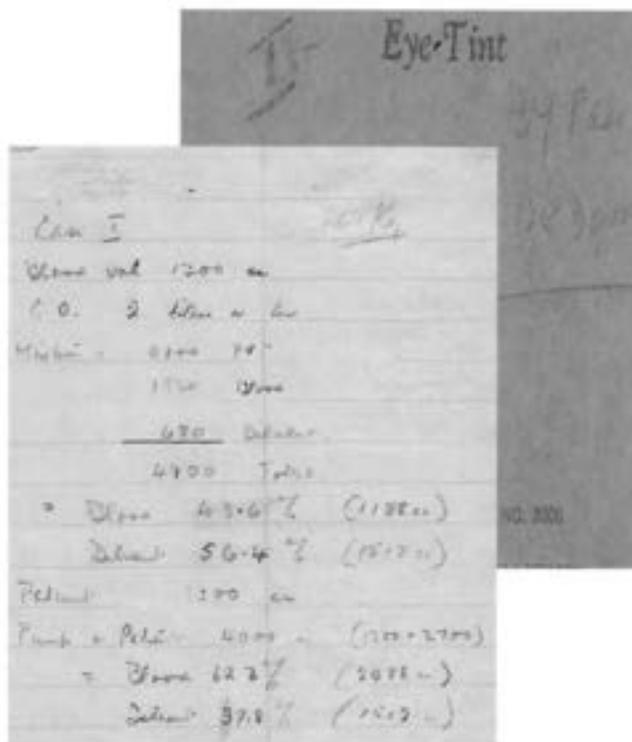


Fig. 4. Notebook dated March 1955. The name on the cover is D. E. Donald. On the first page is a checklist for the preparation of the heart-lung machine. On the second page is written "case 1" that of a 5-year-old girl who underwent ventricular septal defect repair, the first cardiac procedure using cardiopulmonary bypass in Rochester. The following pages document physiologic variables and perfusion management throughout the procedure.

management, hemodynamics, and oxygen balance. Later came descriptions of the management of patients with specific cardiac lesions such as transposition of the great vessels or Tetralogy of Fallot. Anesthetic and monitoring techniques were refined between 1955 and 1961, and the productive relationships that were previously established maintained their momentum. After Dr. Swan had been appointed director of the cardiac catheterization laboratory in 1957, he, together with Drs. Moffitt, Brian Dawson (1927-1987), Richard O. Lundborg (1933- ), and Alan D. Sessler (1932- ), described the physiologic changes and the management, as well as the complications occurring in patients undergoing cardiac catheterization. At the Mayo Clinic, the capability to perform blood gas analyses was developed primarily by Drs. Donald, Theye, Kai Rehder (1928- ), and Moffitt. The resources for blood gas analyses remained in Dr. Moffitt's research laboratory supported by the National Institutes of Health until the intensive care units were established. In 1961, Dr. Patrick decided to move back to the Methodist Hospital to work with Dr. Clagett. In 1962, Dr. Theye gave up clinical anesthesia to become a full-time investigator. At that time, Dr. Sessler became primarily responsible for the administration of anesthetics for Dr. Kirklin's patients, while Dr. Moffitt worked primarily with Dr. McGoon and Dr. Devloo with Dr. Ellis.

The applications of cardiopulmonary bypass practice were extended as surgical and anesthetic experience increased and technical improvements in the heart-lung machine were made. Drs. Theye, Rehder, Michenfelder, and Edward F. Daw (1929- ) were intimately involved in the development and clinical use of profound hypothermia ( $-15^{\circ}\text{C}$ ) with cardiopulmonary bypass and circulatory arrest for repair of intracranial aneurysms by Dr. Alfred Uihlein (1908-1990). As intraoperative management became more routine, Drs. Moffitt and Sessler were able to direct greater attention to the post-operative care of the cardiac surgical patient.

Many insights gained during that period remain of current interest or were later rediscovered or investigated. Publications during this period discussed such things as post-bypass thrombocytopenia, bleeding disorders and the use of antifibrinolytics, humoral changes with cardiopulmonary bypass, inhomogeneity of cooling and rewarming, and cognitive disorders after cardiac surgery in adults. Ten years after the first ventricular septal defect was repaired in a 5-year-old girl, cardiothoracic surgeons and anesthesiologists at the Mayo Clinic had conducted

almost 4,000 operations utilizing cardiopulmonary bypass.

In the early 1970s, cardiac anesthesiologists extended the physiologic expertise that resulted from collaborations with Drs. Wood, Swan, and Donald in the development of cardiac surgery. Dr. Moffitt studied whole-body and cardiac metabolism in cardiac surgical patients, and new department members, such as Dr. Roger D. White (1939- ) and Dr. Sait Tarhan (1927- ), were included in clinical cardiac anesthesia research.

## 2. Risk Factors for Adverse Outcomes

Cardiac surgery and anesthesia continued to progress at the Mayo Clinic, but prominence in another area soon followed. Drs. Tarhan, Moffitt, and colleagues turned their attention to the demographics of the surgical population and recognized the tremendous potential of the Mayo Clinic database for better predicting the risks for the patients undergoing cardiac surgery. In the largest study of its kind, Dr. Tarhan, Moffitt, and colleagues characterized the risk of perioperative myocardial infarction (MI) in patients who had sustained a previous MI. They reported their findings in the *Journal of the American Medical Association* in 1972. The study was vital to the understanding of patient risk and in decisions about the scheduling of elective surgery in patients with previous MI. That paper provided several observations that can be considered as one of the most influential in anesthesia during the last 30 years. The article authored by Dr. Tarhan was ahead of its time in providing an academic focus on demographics and patient risk factors rather than perioperative management per se.

## 3. The Defining of the Subspecialty

The time between the mid-1970s and 1980s might be considered the next period of development in cardiothoracic anesthesia at the Mayo Clinic. After about 1970, much of the attention in cardiac surgery shifted first towards heart valve replacements and then towards coronary artery bypass grafting in adults. During this time, organizational changes occurred that functionally and administratively helped define cardiothoracic anesthesia as a sub-specialty in Rochester. New operating rooms were opened at Saint Marys Hospital in 1982, and the division of cardiovascular anesthesiology was formed in 1984, with Dr. Michael Nugent (1943- ) as its head. By the end of that decade, all of thoracic and cardiovascular surgery was consolidated in one geographic area. Drs. Patrick, Theye, Devloo,

Moffitt, Sessler, and Tarhan formed the first functional cardiothoracic anesthesia core group. With the dramatic increase in the knowledge required to perform state-of-the-art surgery, sub-specialty training in cardiovascular and thoracic anesthesia was necessary. A clinical track in cardiovascular and thoracic anesthesia was introduced into the residency program, which later evolved into a cardiothoracic fellowship (Table 1). During the last two decades, new surgical procedures, for example surgery for dysrhythmias and hypertrophic cardiomyopathy, and new technologies such as echocardiography and intra-aortic balloon counterpulsation have been introduced; older techniques such as valve repair have been refined, and off-pump cardiac surgery has become a reality.

The introduction of potent, relatively short-acting narcotics such as fentanyl and vasoactive medications such as nitroprusside and inotropes like dopamine and dobutamine had a pivotal role in the ongoing success of cardiac anesthesia and surgery. The use of many of these medications was largely confined to patients undergoing cardiac, thoracic, and major vascular surgery. During this period, Dr. John H. Tinker (1941- ) and colleagues studied the pharmacology of these drugs in cardiac surgical patients. They reported on the application of the first beta-blocker (propranolol) in patients undergoing coronary surgery, as well as on the uses and toxicities of sodium nitroprusside, dopamine, and dobutamine

in cardiac surgical patients. Dr. Tinker also identified and addressed the problem of "temperature afterdrop" in cardiac surgical patients and advocated changes in the monitoring of temperature during cardiopulmonary bypass to assure adequate rewarming. Additionally, the work on myocardial oxygen consumption and metabolism during the early 1970s allowed Dr. Roger D. White to focus on the diagnosis, mechanisms, and treatments of cardiac arrhythmias in ischemic heart disease. Dr. White's investigations of out-of-hospital cardiac arrests resulted in his having a pivotal role in the development of guidelines for basic and advanced cardiac life support.

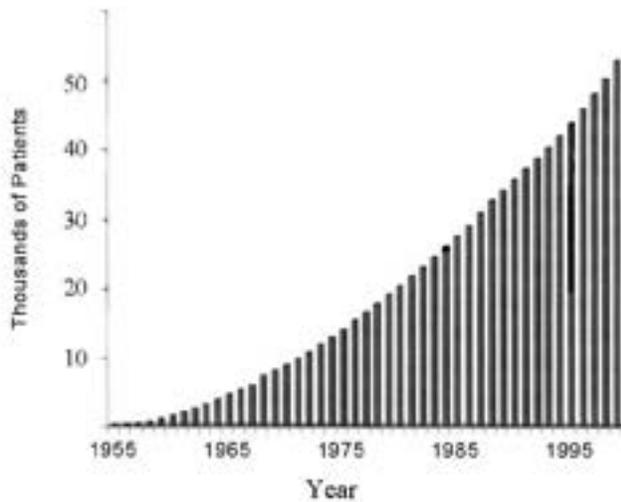
In contrast to the dramatic progress made during the early years of cardiovascular and thoracic anesthesia at the Mayo Clinic, the last 10 to 15 years have shown incremental changes. Some of the more notable work during this period has been the characterization of the effects of volatile and intravenous anesthetics on myocardial contractility and relaxation by Dr. Philippe R. Housmans (1953- ) and the work on the effects of volatile anesthetics on the smooth muscle of coronary arteries by Dr. J. Christopher Sill (1950- ). Members of division of cardiothoracic and vascular anesthesiology under the guidance of Dr. Martin D. Abel (1952- ) have published widely in peer-reviewed journals on intraoperative echocardiography in cardiac surgery, on postcardiac surgical bleeding, on cerebral perfusion, and on the physiologic limits of hemodilution during cardiopulmonary bypass.

The cardiothoracic section has continued to grow. Whereas during the first 10 years of cardiac surgery at the Mayo Clinic, approximately 4,000 patients underwent cardiac surgery, 8,000 patients had cardiac surgery in the second, and 13,000 in the third decade. In 1999, more than 2,650 scheduled cardiac surgical cases were done at Saint Mary Hospital, in addition to approximately 1,600 major thoracic and 1,500 vascular cases. By the end of 1999, the Mayo Clinic experience in cardiac surgery exceeded 50,000 operations (Fig. 5).

A chapter on the history of cardiovascular and thoracic anesthesia would be incomplete without recognition of the role of nurse anesthetists in the practice. As is true today, certified registered nurse anesthetists (CRNAs) have had a crucial role in cardiothoracic anesthesia for 40 years. In cardiothoracic anesthesia their contributions began with Loren Crofton (1926- ) and Bernard P. Gilles (1930- ). Loren Crofton was appointed the first cardiovascular nurse anesthetist supervisor. In 1968, Burdette V. Polk (1943- ) succeeded him. The supervisors and nurse anes-

**Table 1.**  
Cardiovascular/Thoracic Anesthesia Fellows

<p>Scott D. Augustine            Ashraf F. Banoub            Roxann D. Barnes            Susan M. Beath            Gilbert A. Blaise            Xuan (Joy) Cai            David J. Cook            Maria A. deCastro            David L. Dickerman            Scott A. Eskuri            John C. Frenzel            Suneerat Kongsayreepong            Beng-Ling Liam            Ian MacVeigh            Lamond G. Mc Quarrie            Thiru K. Namasiwayam            Kent H. Rehfeldt            Jeffrey L. Roth            Rajbir S. Sarpal            William T. Sharp            William J. Siscek            Paul E. Stensrud            Norman E. Torres            Mark F. Trankina            Joseph D. Tricarico            Chris M. Weinlander</p>
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**Fig. 5. Cumulative number of cardiac surgical operations performed between 1955 and 1999 at the Mayo Clinic Rochester.**

thetists who have followed them continue to make important contributions to the care of the cardiac surgical patients. Their work has made it possible for the staff to have more time for research, education, and advancement of the specialty.

#### 4. Summary

Cardiovascular and thoracic anesthesia has much of its origins in Rochester, Minnesota. Unique discoveries came from Dr. Wood and his colleague's human circulatory physiology laboratory in the 1940s. Benefit has resulted from Dr. Wood's practical genius, from the foresight of the Mayo Clinic in committing the section of engineering to Dr. Wood's and Kirklin's vision, and from the courage and determination of Drs. Kirklin, McGoon, and Ellis. A debt is also owed to Drs. Pender, Patrick, Theye, Moffitt, Devloo, Tarhan, and the others who selflessly committed themselves to the extraordinary demands that cardiac surgery placed on them as the sub-specialty was created.

#### 5. Acknowledgements

I would like to thank Dr. Carolyn S. Beck in the Mayo historical unit and Drs. Emerson Moffitt, John Tinker, Sait Tarhan, Martin Abel, and especially Dr. Robert Devloo, for their help and insights in preparing this manuscript.

*David J. Cook*

## B. Neuroanesthesia

Neuroanesthesia as an identifiable subspecialty had its birth in the United States at the Mayo Clinic. This birth came about as a result of a busy clinical neurosurgical practice combined with the emergence of a group of anesthesiologists who progressively narrowed their practice to this developing entity.

In the 1950s, Dr. John E. Osborn (1919-1957) began to focus on providing anesthesia for neurosurgery, in part because of his friendship with neurosurgeon Dr. Collin S. MacCarty (1915- ). Dr. Osborn was joined in this effort by Dr. Howard R. Terry (1923-1991) in 1957. The latter individual soon became the major provider of neurosurgical anesthesia after Dr. Osborn's premature death secondary to metastatic brain tumors. Subsequently, Dr. Terry recruited Dr. Edward F. Daw (1929- ) in 1960. Together, they received departmental approval to limit their practice exclusively to neurosurgical anesthesia. Thereafter, Dr. John D. Michenfelder (1931- ) joined the group in 1961, after a 1-year fellowship with them. At that time, four operating rooms were dedicated to neurosurgery, which accommodated six neurosurgeons.



Fig. 1 Cerebral aneurysm surgery performed under profound hypothermia produced by open-chest cardiac bypass.

The primary justification for adding a third member to the group in 1961 was the introduction of a new surgical technique by Drs. Alfred Uihlein (1908-1990) and MacCarty using profound hypothermia ( $\approx 15^{\circ}\text{C}$ ) for cerebral aneurysm surgery (Fig. 1). Initially, this technique required both open chest cardiac bypass and craniotomy. With experience, the cardiac bypass was simplified by the use of a closed-chest technique. On average, the procedure required between 8 to 14 hours of anesthesia time and demanded exclusive dedication on the part of both the responsible neurosurgeon and anesthesiologist. The challenge provided by this revolutionary technique spawned the introduction of clinical research into neurosurgical anesthesia at the Mayo Clinic, aided by the interest and skills of Dr. Richard A. Theye (1923-1977). Twelve publications, authored or coauthored by the involved anesthesiologists, resulted from this activity. This experience culminated in an international presentation sponsored by the American Society of Anesthesiologists (ASA) at its national meeting in Chicago, Illinois, in 1964, consisting of a 30-minute video depicting the intricacies of the technique followed by a 30-minute panel discussion between physicians in London, U. K., and physicians in Chicago. The live panel was hailed as being the first use of satellite TV transmission at a major medical meeting. By the mid-to-late 1960s, the technique of profound hypothermia was largely abandoned because of disappointing long-term results. Still there persisted a residual of international recognition of both the involved neurosurgeons and the anesthesiologists.

During this same period (1960-1965), the anesthetic management of routine neurosurgical procedures changed dramatically. The use of ether, trichlorethylene, and cyclopropane was discontinued in favor of the use of halothane, while nitrous oxide remained favored as a supplemental agent. Most revolutionary was a change from the time-honored use of spontaneous respiration, in order to monitor the function of the respiratory center, to the use of controlled hyperventilation with mechanical ventilators. The latter procedure became accepted as a means of reducing brain bulk, while close monitoring of cardiac function replaced the need to monitor spontaneous respiration.

As a result of its extensive experience with the routine use of prolonged mechanical ventilation, the neurosurgical anesthesia group volunteered

their services for the management of patients suffering from tetanus. Although tetanus was uncommon in the United States at that time, an average of four to six patients with tetanus each year was seen at the Mayo Clinic. Medical management usually relied upon sedation with Avertin applied rectally and supplemented with hypnotics and analgesics. In patients with severe tetanus, the outcome was routinely dismal. A few other centers around the world had reported positive results in tetanus management using prolonged muscle paralysis with curare-like drugs and, of course, continuous mechanical ventilation. This service was offered by the neuroanesthesia group and accepted by the heretofore responsible medical team. At the time, mechanical ventilation of the lungs of patients at the Mayo Clinic was limited to the surgical suites, including the recovery room. Considerable concern was expressed by the nursing staff regarding the introduction of mechanical ventilators on the medical floors. Mechanical ventilation was initiated, with some reluctance, in the neurosurgical intensive care suite for the management of a severe tetanus case. The patient recovered completely after several weeks of continuous mechanical ventilation. Thereafter, mechanical ventilation gradually became a recognized and welcomed intervention for the management of multiple medical problems throughout the Mayo Clinic facilities.

In 1965, a serendipitous observation by Drs. Michenfelder and Daw led to a change in neurosurgical anesthetic practice that eventually became a worldwide standard. In an anesthetized patient in the sitting position venous pressure was being monitored with a central venous catheter, when abrupt unexpected severe signs of venous air embolism developed. Preventative measures were immediately taken, and in addition, blood was aspirated through the lumen of the central venous catheter. Unexpectedly, large volumes of air mixed with blood were aspirated and the signs of air embolization rapidly subsided. This experience was repeated within a few months in a second patient, and thereafter, central venous catheters were routinely placed in all patients being operated in the sitting position, at the time, 200 to 300 such patients each year. The initial experiences in the first two cases were reported in 1966, and thereafter a prospective study in a large series of patients, demonstrating the efficacy of such management, was reported in the *Journal of American Medical Association* in 1969. As a result of this effort, placement of a central venous catheter became the standard of practice for

patients at risk for air embolism. This practice was modified somewhat by the recognition that the Doppler apparatus might provide a sensitive monitoring device for early recognition of air embolism. This practice was again evaluated in a prospective study and proven to be a valuable addition for the diagnosis and management of air embolism. These results were published in 1972, which, along with positive reports by others, led to the adoption of routine Doppler monitoring. This practice quickly became standard in conjunction with the placement of central venous catheters.

Major changes in the neuroanesthesia group occurred between 1965 and 1966. Drs. Terry and Daw both resigned to enter private practice by late 1965. Dr. Kai Rehder (1928- ) was recruited to the staff in 1966, with the understanding that he, along with Dr. Michenfelder, would be given 50% time for research, while together providing one full-time equivalent for clinical neurosurgical anesthesia. They alone provided staff clinical neuroanesthesia coverage until later in 1966, when they were joined by Dr. Gerald A. Gronert (1933- ). The group further changed in 1968, when Dr. Joseph M. Messick (1935- ) was recruited, after which Dr. Rehder became a full-time investigator in 1972.

In the late 1960s, the editor-in chief of the journal *Anesthesiology*, Dr. Leroy D. Vandam (1914- ) solicited a review article concerned with anesthesia for neurosurgery. Drs. Michenfelder, Gronert, and Rehder agreed to this undertaking, and in 1969, the article was published with the simple title they chose: *Neuroanesthesia*. The article was comprehensive and very well received by the practicing anesthesia community. In part because of this article, the Mayo Clinic was recognized as the birthplace of this subspecialty in the United States, and the name of the subspecialty was thereafter tagged with the title of the article: *Neuroanesthesia*, a term not previously in use.

In the years that followed the 1960s, clinical research by the neuroanesthesia group was active and productive. With the arrival of the neurovascular neurosurgeon Dr. Thor Sundt (1930-1992) in the early 1970s, carotid endarterectomy became part of the routine, busy neurosurgical practice; prior to this time, carotid surgery had been done by the cardiac surgeons at the Mayo Clinic. Dr. Sundt introduced for these procedures the monitoring of cerebral blood flow and, with the assistance of the neurologist Dr. Frank W. Sharbrough (1935- ), the intraoperative recording of a standard 16-channel electroencephalogram (EEG). In subsequent years,

this addition provided continual opportunities for evaluating the effects of various anesthetic agents and techniques on these monitored variables, and led to multiple publications. These evaluations included the efficacy of monitors purported to recognize possible cerebral ischemia during carotid surgery, as for example, stump pressure. In addition, anesthetic agents and techniques associated with the lowest incidences of cerebral ischemia during carotid occlusion were identified.

The introduction of mass spectrometry to the neurosurgery operating rooms in 1982, spearheaded by Dr. Messick, provided measurement of inspiratory and expiratory concentrations of oxygen, nitrogen, carbon dioxide and inhaled anesthetic agents, and display of the carbon dioxide waveform. This was a significant advance in patient monitoring, including the detection of changes in ventilation-perfusion relationship, such as can occur with venous air embolism. This monitoring technique later was provided in all operating rooms.

During the 1970s, the neuroanesthesia group expanded with the addition of Dr. Roy F. Cucchiara (1943- ) in 1973, followed by Dr. Ronald J. Faust (1944- ) in 1976. Dr. Cucchiara became very active in pursuing clinical research, while Dr. Faust focused his interest primarily on resident education. Important studies pursued during this period included evaluation of the effect of various anesthetic agents and techniques on intracranial pressure. Such evaluation was done in response to a growing international debate regarding the possible dangerous effects of volatile anesthetic agents on intracranial pressure. These studies, first of halothane and then of isoflurane, demonstrated that, when these agents were administered in low concentrations, combined with hyperventilation, no significant increases in intracranial pressure occur in patients undergoing brain surgery for removal of mass lesions. As a result, along with confirmatory studies by others, volatile anesthetics continued to be used by many practitioners for neurosurgical procedures.

In the 1980s, further important personnel changes took place in the neuroanesthesia group. Dr. Michenfelder reduced his clinical time to 30% in order to take on the duties of editor-in-chief of the journal *Anesthesiology* in 1980. Dr. Gronert resigned from the Mayo Clinic in 1986 and moved to the University of California in Davis, and Dr. Cucchiara was appointed chairman of the department of anesthesiology at the Mayo Clinic, in 1988, restricting his availability for clinical coverage. As partial replacements, Dr. Leslie

Newberg Milde (1943- ) joined the group in 1982, followed by Dr. William L. Lanier Jr (1955- ) in 1987. Each of these individuals provided approximately 50% clinical coverage while devoting their remaining time to research or educational activities. During this period, a formal neuroanesthesia fellowship was created to meet the requirements of the American Board of Anesthesiology for specialty training of senior residents (Table 1). As a result, a series of well-qualified senior residents rotated through the neurosurgical corridor, supplementing the clinical coverage, and thereby better enabling members of the group to pursue clinical research as well as their other academic commitments. By this time, there were six operating rooms dedicated to neurosurgery, which accommodated eight neurosurgeons. A "snapshot" of the clinical load in 1989 revealed the following: 2,987 major surgical procedures including 463 craniotomies (117 aneurysms); 187 posterior fossa explorations; 99 transsphenoidal hypophysectomies; 151 carotid endarterectomies; 880 laminectomies; 272 stereotactic procedures; 114 shunts; 68 peripheral nerve procedures; and 753 "other" procedures. The year 1989 was a typical year.

One of the clinical research projects pursued during this time was the evaluation of transesophageal echocardiography for the detection of air embolism and the evaluation of cardiac function during neurosurgery, spearheaded by Dr. Cucchiara. Transesophageal echocardiography was new at the time (1983) and had only been utilized in the operating room during cardiac surgery by one anesthesia group at the University of California, San Francisco. With the

**Table 1.**

Neuroanesthesia Fellows

Perry S. Bechtle
Susan Black
John K. Boudreaux
Thomas J. Christopherson
Robert M. Craft
Carl J. Daltner
Niki M. Dietz
Robert E. Grady
Daniel J. Janik
Leonard J. Lozada
Robert D. McKay
Leslie N. Milde
Donald A. Muzzi
Annette G. Pashayan
Tomasz Z. Polis
Cynthia F. Schwartzburg
Jeffrey A. Steinkeler
Christopher R. Turner
Charles T. Wass
Jessica A. Wolin

encouragement and cooperation of a cardiologist familiar with the equipment, Dr. James B. Seward (1942- ), the project was designed primarily to monitor patients at risk for air embolism to determine whether the device could permit recognition of paradoxical air embolism. Such embolism was considered an unusual but potentially devastating complication, which resulted in systemic embolization of the air, usually via a patent foramen ovale. The device was effective for this purpose and in addition was useful in identifying preoperatively patients with a patent foramen ovale and therefore at greater risk for paradoxical embolism. With improved technology, such as smaller probes and an improved image resolution, transesophageal echocardiography soon came into common usage in both the neurosurgical and cardiac operating rooms at the Mayo Clinic. This activity resulted in seven publications that described the efficacy of such monitoring.

In the 1990s, a number of major personnel changes occurred. Dr. Cucchiara resigned in 1991 and moved to Gainesville, Florida, where he subsequently became chairman of the department of anesthesiology. Dr. Messick left the neuroanesthesia group in 1991 to pursue full-time in-hospital pain management and to start the acute pain service at Saint Marys and Methodist hospitals. Dr. Michenfelder retired in 1993. Dr. Milde transferred to the Mayo Clinic in Scottsdale (Arizona) in 1994. The new anesthesiologists, recruited specifically for neuroanesthesia during this time, were sequentially: Dr. Donald A. Muzzi (1955- ) in 1991, Drs. William J. Perkins (1954- ), Thomas James Losasso (1959- ) and Margaret R. Weglinski (1959- ) in 1992. In addition, other members of the staff generally rotated through neuroanesthesia, usually on a quarterly basis. Dr. Muzzi resigned from the Mayo Clinic in 1993 to enter private practice, and he was followed by Dr. Losasso in 1995. Despite these major changes, commitment on the part of all of these individuals continued to both clinical and laboratory research, as reflected by the many publications during this time.

Beginning in the late 1950s and into the new millennium, the designated heads of the neuroanesthesia group were sequentially: Drs. Terry,

Michenfelder, Gronert, Messick, Cucchiara, Muzzi, and Weglinski. Each of these persons brought their own agenda and style to this position, but without exception, all individuals strongly supported and nourished academic pursuits, including clinical research, laboratory research, editorial responsibilities, educational projects, and administrative activities. Members of the neuroanesthesia group were productive in many different ways during this 40-year period, as reflected in part by the following: More than 50 publications resulting from clinical research projects; more than 200 publications resulting from laboratory research projects; publication of three text books: *Anesthesia and the Brain* by Dr. Michenfelder, *Clinical Neuroanesthesia* by Drs. Cucchiara and Michenfelder (two editions), and *Anesthesiology Review* by Dr. Faust (two editions). In addition, two members of the group served as editors-in-chief of major journals: Dr. Michenfelder was editor-in-chief of *Anesthesiology* from 1980 to 1986, and Dr. Lanier was appointed editor-in-chief of *Mayo Clinic Proceedings* in 1998. Multiple other achievements and recognitions were accumulated by the various members of the neuroanesthesia group from 1960 to 2000, and these years can best be appreciated by perusing the biographies of the individuals.

Finally, it should be noted that none of the many accomplishments chronicled in this review could have been easily realized had it not been for the continuing presence of a dedicated group of nurse anesthetists. Some of these individuals were a part of the neuroanesthesia group for more than 30 of the 40 years described. This group includes Kenneth J. Kappauf (1928- ), Myron Ricks (1923-1996), Arlene R. Lehman (1926- ), Lois J. Maas (1934- ), Bernie McGovern (1912- ), and Ruth E. Bozikowski (1913- ). The relationship between this group of people and the medical staff was exemplary in all respects and demonstrated on a daily basis the merits of the "team" approach to clinical anesthesia.

*John D. Michenfelder*

## C. Intensive Care

The department of anesthesiology can be proud that it was instrumental in establishing intensive care at the Mayo Clinic. Currently, members of the department continue to be involved in this field, which has become a specialty in its own right. As a major medical referral center, the Mayo Clinic needs excellent intensive care staff and facilities. The story of how these developed is a fascinating one. It is a tale of steady progress but also one of trials and tribulations, overcoming obstacles from both within the institution and from outside. It is one that also had its humorous moments as well. The success of this endeavor would not have been possible without collaborative team efforts among physicians, the dedicated nursing staff, respiratory therapists, dietitians, and numerous other disciplines, who have all brought their expertise and skill to the treatment of patients admitted into the intensive care units. Outstanding persons in each of these fields contributed greatly to the development of this discipline. Finally, over the years, many patients in the units have been helped but others were not. Our unflinching gratitude is owed to each and every one of them for enhancing the knowledge and clinical skills on how to appropriately take care of critically ill patients.



Fig. 1. Dr. Frederick H. Helmholz.

### 1. The Story Before Intensive Care

In 1916, Dr. Walter M. Boothby (1880-1953), a physician anesthetist at the Peter Bent Brigham Hospital in Boston, Massachusetts, well known for his work on respiratory physiology and basal metabolism, accepted an offer from Dr. Henry S. Plummer (1874-1936) to set up a metabolism laboratory in Rochester, Minnesota. The arrival of Dr. Boothby was delayed by his involvement in World War I (1914-1918), but once here, he soon established the standard values of basal metabolism in health and its variations caused by thyroid diseases. Dr. Boothby had an illustrious career in many fields of endeavor. In 1942, he recruited Dr. Frederick H. Helmholz, Jr. (1911- ), a physiologist, to assist him in his work in the metabolism laboratory, to provide oxygen therapy, and to service the tank ventilators used to support the ventilatory function of some patients, particularly poliomyelitis victims. For this work, they had the assistance of two technicians who originally worked as janitors at the Mayo Clinic. Subsequently, Dr. Helmholz became involved in developing other modalities to help patients with respiratory muscle weakness including providing intermittent positive-pressure breathing treatments, designing a pneumobelt and devices to facilitate coughing. He also collaborated with some of the early manufacturers of positive-pressure ventilation devices, which were being found to be superior to the tank ventilators in managing patients who needed ventilatory support.

In the mid-1950s, Dr. Helmholz (Fig. 1) participated in establishing the fledgling cardiac surgery program, directed by Dr. John W. Kirklin (1917- ). Dr. Helmholz provided advice on postoperative ventilatory support when needed for its patients. As this program grew, Dr. Kirklin used to call on Dr. Helmholz's expertise anytime, day or night, when one of his patients had a postoperative respiratory problem. Within a few years, this arrangement proved to be a suboptimal situation for Dr. Helmholz. In the early 1960s, Dr. Helmholz began talking to Dr. Albert Faulconer, Jr. (1911-1985), chairman of the department of anesthesiology at that time about this problem.

A similar unsatisfactory situation regarding the management of patients needing respiratory support was occurring at the Methodist Hospital. Here, likewise such patients were cared for by nurses and residents not formally trained in this field. Dr. E. Paul Didier (1925- ) (Fig. 2), an



Fig. 2. Dr. E. Paul Didier.

anesthesiologist based at the Methodist Hospital at the time, was frequently requested to help treat these patients, often at times only after a crisis arose. In 1964, Dr. Didier wrote to Dr.



Fig. 3. Dr. Alan D. Sessler shown here in his office when he was chair of the department of anesthesiology



Fig. 4. Mr. Bernard P. Gilles, CRNA.

Faulconer documenting his involvement in the care of these patients and identifying the need to establish an intensive care unit at the Methodist Hospital.

## 2. Early Days of the Intensive Care Units

In the subsequent year (1965), Dr. Faulconer established an *ad hoc* committee consisting of Drs. Didier, Helmholtz, John D. Michenfelder (1931- ), and himself to examine these issues. At that time, a new Methodist Hospital and the Alfred Wing at Saint Marys Hospital were under development, and the members of the committee believed that each of these facilities should have a respiratory intensive care unit. The committee concluded that anesthesiologists should direct and staff these intensive care units, because they were hospital-based physicians, could provide 24-hour coverage, and were knowledgeable about respiratory emergencies and providing care to obtunded patients. Despite opposition from some factions within the institution, Dr. Faulconer received permission to establish such intensive care units (ICUs). In 1966, Dr. Didier at the Methodist Hospital and Dr. Alan D. Sessler (1932- ) (Fig. 3) at Saint Marys Hospital, both at that time relatively new members of staff, were each given the task to establish these ICUs at their respective hospitals. These two physicians subsequently were to become elder states-

men in this field and rise to positions of national authority in medicine. To fulfill their task, Drs. Didier and Sessler were each assigned a certified registered nurse anesthetist (CRNA) to work with them.

In January 1966, Dr. Didier with Renee Caspersen (1927- ), CRNA, opened the first ICU at the Methodist Hospital on station 45. The unit was equipped with three beds to treat patients with ventilatory or airway problems (or both) and three beds for patients needing coronary care. Dr. Sessler began his service at Saint Marys Hospital before a dedicated unit for his patients had been opened. In his work, Dr. Sessler was assisted by Mr. Bernard P. Gilles (1930- ), CRNA, (Fig. 4), a taciturn ex-infantry North Dakotan who possessed real leadership skills and subsequently became a pivotal, vital member of the team responsible for the success of respiratory intensive care in our institution. In 1967, Dr. Didier's unit was moved to station 65 in the Methodist Hospital and Dr. Sessler was able to consolidate many of his patients with the opening of the 3-Alfred Unit at Saint Marys Hospital. The Methodist ICU was to move again briefly to station 85 before finally finding a permanent home on station 11-1 in the early 1970s (Fig. 5). Drs. Didier and Sessler were each responsible for



Fig. 5. The 11-1 Intensive Care Unit at the Methodist Hospital in the early 1980s. Note the monitoring equipment including galvanometers used to display invasive pressure signals.

directing their own units. The annual report of 1967 stated that the 3-A unit of Saint Marys Hospital admitted 297 patients and the Methodist ICU admitted 201 patients, of which 108 were admitted for cardiac care and the rest for respiratory support. Electrocardiogram and invasive arterial pressure monitoring were performed on as-needed basis. Bird pressure-preset ventilators were the usual devices used to provide ventilatory support. The nurse anesthetist was responsible for providing chest physiotherapy and a tracheotomy care service.

At Saint Marys Hospital, analysis of blood specimens for determinations of blood gas tensions and pH was initially performed using equipment available in the research laboratory directed by Dr. Emerson A. Moffitt (1924- ) and supported by National Institutes of Health (N. I. H.). Dr. Kai Rehder (1928- ), as a fellow in anesthesiology, had worked with Drs. Richard A. Theye (1923-1977) and Ward S. Fowler (1915-1982) and had gained extensive experience in the research laboratory with the use of the oxygen electrode. This experience facilitated the subsequent use of the electrodes for clinical purposes. In 1967, the new ICUs at both hospitals acquired space near them in order to house blood gas analyzers.

At the same time that these ICUs were being established, attempts were initiated within the institution to improve the caliber of emergency resuscitation services in both hospitals. Before this time, many areas in these hospitals lacked the trained personnel and resources to provide such a service. Dr. Didier, having emphasized this fact in a letter to the institution's clinical practice committee, was named chair of a resuscitation committee charged with addressing this issue. Over the objections of some eminent physicians at the institution, a training program on resuscitation was launched. In 1966, Dr. Didier and Mr. Earl A. Schwerman (1933- ), head of the Methodist Hospital's pharmacy, initiated the "Code 45" cardiopulmonary arrest call system. This number was chosen because it was not in use at the clinic at that time and was instantaneously recognizable. Initially, when the telephone system announced such a "Code 45", pre-assembled boxes containing the necessary equipment and drugs were taken from the operating rooms and pharmacy to the scene where the primary service performed the resuscitation. This protocol proved to be unsatisfactory, and from 1968 onwards, designated members from the ICU staff and the division of cardiovascular diseases & internal medicine were charged with providing the resuscitation effort.



Fig. 6. Dr. Kai Rehder.

The number of patients managed in the ICUs during the next few years increased rapidly. This increase occurred because Drs. Sessler and Didier always made their services available. In so doing, they overcame significant reservations about the value of ICUs in many quarters. In 1968, 524 patients were cared for in the ICU of the Methodist Hospital. In 1969, 860 patients were managed in the Methodist Hospital's ICU and 673 in the 3-Alfred unit at Saint Marys Hospital. In addition, the Saint Marys service provided a daily consultation for all ventilator-dependent patients in the other ICUs at that hospital. Such patients were found in cardiac surgical units, the coronary care, neurosurgical, and pediatric ICUs. Rounds on these patients involved a 3-mile walk each day for the team.

At this time, the division of thoracic diseases & internal medicine was providing only a consulting service to ICU patients on an as-needed basis. The year 1968 was the first in which the department of anesthesiology made representations to the board of governors that the division of thoracic diseases & internal medicine should become more involved in this growing field. Although repeated on an annual basis, this suggestion was to remain unanswered until the next decade.

In 1968, Dr. Kai Rehder (Fig. 6) joined the ICU at Saint Marys Hospital and began his long and

distinguished research effort into the pathophysiology of the impaired gas exchange associated with anesthesia and mechanical ventilation of the lungs. Initially, Dr. Rehder also had clinical responsibilities and the task of assisting in the setting up of a pulmonary function laboratory adjacent to the unit at Saint Marys Hospital, which opened in 1969. Dr. Rehder was successful in attracting some outstanding young investigators, who also worked in the units while they were in Rochester. The first to come was Dr. David J. Hatch (1938- ) from England in 1968. Subsequently, he has become a professor of anesthesiology and an authority on pediatric respiratory physiology and anesthesia based in London. Dr. H. Michael Marsh (1939- ) from Australia did research in Dr. Rehder's laboratory in 1969 and subsequently returned from Australia to the institution to make many valuable contributions in a leadership capacity. In 1970, Dr. Rungson Sittipong (1941- ) from Thailand became a research fellow in Dr. Rehder's laboratory, a position that would lead to his appointment to the staff.

Continued growth of both ICUs, still distinct from each other, continued in 1970. That year marked the appointment of another much-respected CRNA, Myron Ricks (1923-1996), who soon became the heart and soul of the institution's airway management and cardiopulmonary resuscitation courses. Two respiratory therapists also were appointed for the first time that year.

### 3. Section of Respiratory Intensive Care and School of Inhalational Therapy

In 1971, Dr. Richard A. Theye became chair of the department of anesthesiology. In November of that year, the board of governors of the Mayo Clinic approved his request to establish a section of respiratory intensive care within the department of anesthesiology. This section was to be created by combining the two previously separate hospital services into a single administrative unit. Dr. Sessler was named head of this section. A proposal for the section to provide primary care was also approved at this time. The division of thoracic diseases & internal medicine agreed that, beginning in 1972, two of its consultants would participate on a part-time basis in the care of patients in this section. Dr. Rehder was named in charge of the section's research effort while he continued to be involved in the pulmonary function laboratory and to provide some clinical care. Dr. Didier was given the responsibility of leading the effort to establish a newly proposed inhala-

tional therapy (later to be called "respiratory therapy") school to be directed jointly by the Mayo Clinic and the Rochester State Junior College. Dr. Helmholtz helped in this last effort, which fortuitously was occurring at the time that the National Board of Respiratory Care was being formed. Finally, Mr. Gilles was appointed coordinator of both the section and the new proposed school.

Growth in the clinical workload in the ICUs continued in 1971. Mr. Lester J. Clapp (1937- ), another well-known person from the early days who had worked as a research technician with Dr. Khalil G. Wakim (1907-1985) in the department of physiology, joined the group in 1971 and worked in the blood gas laboratories. With the growth of the section, senior residents from the department of anesthesiology and the division of thoracic diseases & internal medicine began rotating through the service, and a vigorous teaching effort was mounted to ensure that they had a worthwhile training experience.

The year 1972 was the first year of the respiratory intensive care section. Anesthesiology consultants rotating on this service were Drs. Sessler, Didier, Sittipong, and Sheila M. Muldoon (1935- ). For the first time, they were joined by two consultants from the division of thoracic diseases & internal medicine, Drs. William W. Douglas (1934- ) and Matthew B. Divertie (1924-1986). Even though the latter two physi-

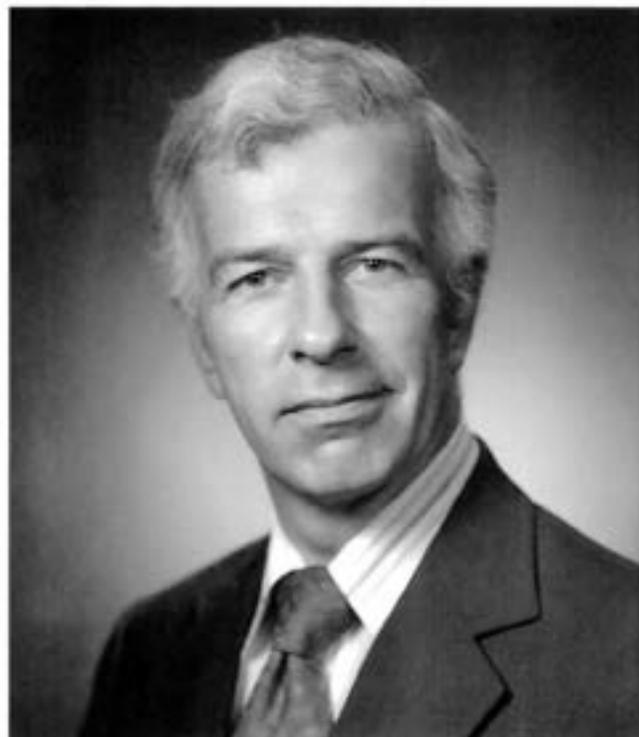


Fig. 7. Dr. William W. Douglas.



Fig. 8. Dr. Matthew B. Divertie.

cians worked only on a part-time basis, they added greatly to the strength of the service. Dr. Douglas (Fig. 7) was a consummate clinician and a first-class educator, and Dr. Divertie (Fig. 8) or Uncle Matt, as he was affectionately known, possessed these skills as well as being a recognized authority on acute lung injury. In the paramedical staff, Mr. Burdette V. Polk (1943- ), a CRNA, and Mr. Thomas R. Holtackers (1943- ), a physical therapist, began working in the section. The service started assuming primary care responsibilities for some patients at the Methodist Hospital. Volume-preset ventilators were purchased in significant numbers, and positive end-expiratory pressure was employed for the first time at the Mayo Clinic. The dedicated laboratory facilities started performing electrolyte determinations, in addition to blood gases analyses. Respiratory order forms were developed to track the work performed, and a cleaning and service area for respiratory equipment was established in the basements of both hospitals. Dr. Rehder was now permitted to pursue his research efforts on a full time basis. Finally, seven students were enrolled in the first year of the inhalational therapy school at the Rochester State Community College. This development was perceived as real progress to fulfill the continued need for growth.

The year 1973 was a year of consolidation. The first class of respiratory therapists graduated



Fig. 9. Dr. H. Michael Marsh.

after their clinical training at the Mayo Clinic. Drs. Divertie and Douglas began devoting 50% of their time to working in the units. The year was one of continued growth in patient numbers, and the section began assuming primary care for some patients at Saint Marys Hospital, in addition to having this responsibility at the Methodist Hospital. The section had five senior residents. Two of these residents were Dr. Denis A. Cortese (1944- ), currently the chief executive officer of the Mayo Clinic Jacksonville, and Dr. Peter A. Southorn (1941- ), from the United Kingdom. The clinical workload demanded that these residents be on-call every other day several weeks at a time. Called to a "Code 45" while taking a shower at 5:00 a.m. before morning rounds, one of the residents proceeded to resuscitate the patient successfully while a towel around his midriff fell to the ground. Hilarious instances like this occurred with some regularity and became the stuff of legend associated with these early days.

In 1974, Dr. Muldoon left the service. She was to continue her research interest and became a recognized authority in malignant hyperthermia. Dr. Marsh (Fig. 9) returned from Australia. He and Dr. Sittipong from Thailand (Fig. 10) became full time consultants in this activity. Clever, charming, and affable but a bit disorganized Michael and brilliant and kind Rungson, who knew more about respiratory physiology than

anyone else and spoke English in his own inimitable oriental syntax, were wonderful characters to have on staff. They were the advance guard of what became to be called in the department of anesthesiology "Sessler's foreign legion in intensive care." Indwelling pulmonary artery catheters were utilized for the first time at the Mayo Clinic in the ICUs, and a Baby Bird ventilator was purchased to ventilate the lungs of children needing ventilatory support. Significant clinical research efforts began this year. Studies on phrenic nerve pacing were initiated to determine whether such pacing could benefit quadriplegic patients. Two patients with acute respiratory distress syndrome were placed on extracorporeal membrane oxygenators in ultimately unfortunately failed attempts to provide life support while they recovered from their acute lung injury. A proposal was submitted to the N. I. H. seeking funds to examine treatment of this life-threatening lung injury. Whole lung bronchial lavage was performed for the first time at the Mayo Clinic to treat a patient with alveolar proteinosis. On the administrative front, the service began to work in the new ICU on the top floor of the Methodist Hospital. The service also overcame an attempt to cut back on the employment of respiratory therapists in favor of using more intensive care nurses. This attempt came to be known as the "Black Sting" by the respiratory therapy community. In 1975, Dr. James A.



Fig. 10. Dr. Rungson Sittipong.



Fig. 11. Dr. Douglas R. Gracey.

Prentice (1937- ) joined the section briefly, and Dr. Denis C. Moriarty (1944- ) from Ireland, who later in his career was to become dean of the Faculty of Anaesthetists in Ireland, worked as a senior resident. Mary Ann Healy (1943- ), a registered nurse (RN), was appointed the first director of intensive care nursing services this year. Residents from the department of internal medicine rotated through the service for the first time this year. The service began managing the ventilatory support of children and neonates in the pediatric ICU at Saint Marys Hospital. A portable metabolic cart was developed to measure patients' oxygen consumption and carbon dioxide production to guide nutritional support. The laboratory began reporting its blood gas values with corrections for the difference between the patient's temperature and the temperature at which the blood gas tensions had been measured. The old card system used to track patients was replaced by a proper data retrieval system, which could tally the services given and report outcomes of the patient treatments. New monitoring equipment was ordered for both hospitals. The first Siemens model B ventilator was acquired for evaluation purposes only. Finally, the respiratory therapy school became fully accredited this year.

In 1976, Dr. Douglas R. Gracey (1936- ) (Fig. 11) from Chicago, who later was to become the chair of the division of pulmonary and critical care medicine & internal medicine, and Dr. Peter

A. Southorn (Fig. 12) joined the service. Drs. Sittipong and Helmholtz decided to leave the practice of intensive care in 1976. Dr. John C. McMichan (1941- ), an orthopedic surgeon from Australia, joined the service as its first intensive care fellow. The anesthesiologists in the section ceased providing simultaneous coverage of the operating suites and the critical care service when they were on call. The section purchased one of the first cardiac output computers, which was manufactured by the Waters Instruments Company in Rochester, Minnesota. This purchase allowed improved automated determination of a patient's cardiac output using a pulmonary artery catheter. The first of what would become a series of hemodynamic carts was constructed to house this equipment. A fiberoptic bronchoscope was purchased to facilitate airway management. The section started an outreach service, which entailed its residents particularly but also consultants riding on ambulances to outlying hospitals to transport patients needing ventilatory or airway support. The section also became even more heavily involved in the institution's cardiopulmonary resuscitation courses. It established a data base system for diagnostic coding. The year 1976 marked the beginning of a controversy as to whether intermittent positive-pressure breathing treatment was clinically efficacious, and the section decided to formulate



Fig. 12. Dr. Peter A. Southorn.



Fig. 13. Dr. John C. McMichan.

guidelines to ensure that this modality of care and chest physiotherapy were both appropriately utilized. The joint educational conference between the two hospitals staff on Friday mornings was established in 1976. Finally, Mr. Jeffrey J. Ward (1948- ), RRT, joined the Mayo Clinic and began contributing to the respiratory training program.

Illness forced Dr. Theye to step down as chairman of the department of anesthesiology in 1977. Dr. Sessler succeeded him, and Dr. Didier assumed the position of head of the division of respiratory intensive care, while continuing as medical director of the respiratory therapy school. In 1977, Dr. Divertie was honored by being elected president of the American College of Chest Physicians, and in this capacity he was active in the pulmonary advisory committee of the Heart, Lung, and Blood Institute of N.I.H. The major philosophical in-house debate in 1977 was how, in the presence of increasing growth, to control costs and simultaneously provide better care for patients. Many members of the section believed that the solution entailed providing primary care for all the patients. To facilitate this, the members agreed that a more multidisciplinary approach should be established in caring for both medical and surgical patients in the units and that the staff should be augmented with specialists of appropriate disciplines. To achieve this goal, a request was made to the institution for advice on this issue. These sentiments mirrored

a national debate occurring at that time as to the evolving nature of this sub-specialty. More parochially, the section established a group of respiratory therapists to support the placement of intravascular catheters and to aid with measurements of hemodynamics throughout the institution, except in the cardiac surgery units. In 1977, the section finally retired its last Bird pressure preset ventilator, over the objections of the cardiac surgeons.

By 1978, the institution had completed the requested review of its intensive care facilities and personnel. It suggested that it was appropriate to consider forming a multidisciplinary critical care service and that the name of the respiratory intensive care units should be changed to critical care units. After his fellowship, Dr. John McMichan (Fig. 13) joined the staff in 1978 and contributed to making hemodynamic monitoring more convenient, efficient, and accurate. In 1978 residents from the department of pediatrics began to rotate in the section.

In 1979, Dr. Daniel N. Wochus (1943- ) from the division of nephrology & internal medicine and Dr. James A. Meadows, III (1945- ) from the division of thoracic diseases & internal medicine joined the section and Dr. McMichan stepped down to complete his training in anesthesiology. A major effort in 1979 was made to establish a formal critical care teaching curriculum. Planning also started this year to establish new surgical and respiratory intensive care units on the 4th floor in the new Mary Brigh Building at Saint Marys Hospital. Determinations of oxygen tensions by transcutaneous electrodes were begun, especially in the pediatric patient population. Vigorous discussion occurred in-house and nationally as to whether pulmonary artery catheters were overutilized in the care of patients and the risks and benefits associated with the use of this device. At the request of the department of laboratory medicine and pathology, the institutional clinical practice committee (CPC) established an *ad-hoc* committee to recommend which facility should perform laboratory determinations that require a rapid turnaround. This reflected a national trend with departments of laboratory medicine trying to gain control of these facilities. The institution adopted the policy that the emergency laboratories should continue to perform blood gas analyses but that the number of electrolyte and other determinations performed by them should be limited. The CPC decided not to establish satellite hospital-based facilities of the main laboratory but directed that pneumatic tube systems be installed to enhance their services.

In 1980, Dr. Delmar J. Gillespie (1943- ), a pulmonologist who had an extensive research background in pulmonary mechanics from working with Drs. Robert E. Hyatt (1925- ) and Joseph R. Rodarte (1938- ), joined the section. Mr. Ward was appointed program director of the respiratory therapy training program. Events in 1980 included an invitation to the surgeons to join the section and have their residents rotate in it, an approach by the department of pediatrics for pediatric anesthesiologists to become involved in directing the pediatric ICU, the laboratories passing the College of American Pathologists site inspection, opening of the 4-Mary Brigham critical care unit at Saint Marys Hospital, and having a dedicated group of respiratory therapists start participating in the neonatal intensive care unit.

#### 4. Critical Care Service

In 1981, the board of governors of the Mayo Clinic agreed that the departments of internal medicine and anesthesiology should jointly form and conduct a critical care service (CCS). This name change would permit a more collaborative multidisciplinary approach to managing seriously ill patients and the establishment of a critical care training program. The director of CCS would rotate every 3 years between the two departments. Dr. Marsh was appointed the first director of CCS and Dr. Meadows its associate director, with Dr. Divertie being made the director of its training program. These changes were very much in line with what was occurring nationally and with the American Board of Medical Specialties in the late 1970s, establishing a joint commission on critical care medicine to explore having a common sub-specialty certification for this new specialty. To accommodate these changes, the department of anesthesiology created a new section called the critical care respiratory section to be responsible for the blood gas laboratories, chest physical therapy, and respiratory therapy services and to oversee the Rochester Community College-Mayo Clinic school of respiratory therapy. Dr. Didier was named the chairman of this section.

Patient care activities continued to increase in 1981. After completing his anesthesiology residency, Dr. McMichan rejoined the staff of the CCS and began studying the merits of pulmonary artery catheters equipped with fiberoptic oximetry. Significant efforts were made to improve the determination of nutritional requirements of patients. Several of the consultants, led by Dr. Southorn and later by Dr. Gillespie, became interested in high-frequency jet ventilation, and

approximately 10 patients were involved in their studies. Consultants continued their participation in advanced cardiopulmonary resuscitation courses. Drs. Wochus and Meadows spearheaded an effort to form a society of critical care physicians in the upper Midwest. The first meeting of this soon to be named North Central Critical Care Society was held at the Mayo Clinic in 1982.

In 1982, Dr. Martin D. Abel (1952- ), an anesthesiologist, joined the CCS. A very well-liked and respected colleague, his real forte and clinical interest was postcardiac surgery patients, and over time, he spent most of his CCS assignments working with these patients. His clinical research interest at that time was in pulse oximetry. Dr. Abel continued to be a member of the CCS until 1989, when the responsibility of providing care to postcardiac surgery patients was transferred to the cardiovascular section of the department of anesthesiology to which he transferred his commitment. Robert Brigham (1955- ), RN, later in his career to become administrator to the department of anesthesiology, was appointed head nurse of the Methodist ICU in 1982.

Dr. Douglas decided to step down from his involvement in critical care in 1983. Everyone who had interacted with Bill appreciated his kindness and his homespun wisdom, and all profited from his superb educational commitment. Dr. Meadows resigned from the Mayo Clinic in 1983. The critical care fellowship training program, after much work, began this year. A list of physicians who have completed this program is given in Table 1. Until recently, most of the subsequent staff appointments in the CCS at the Mayo Clinic have been made from physicians who participated in this program. The board of governors approved the purchase of a new generation of monitors for the Methodist Hospital unit and the 3-Alfred unit of Saint Marys Hospital. A computer system to track and monitor respiratory therapy services, which had taken 6 years to develop, was finally operational in 1983. Nationally, the talks to establish multidisciplinary critical care certification were not making much progress, and the American Board of Internal Medicine announced that it was examining establishing its own critical care specialty examination. However, at the Mayo Clinic, the mantra of a multidisciplinary based critical care team still held sway.

In 1984, Dr. David J. Plevak (1953- ), an anesthesiologist, and Drs. Rolf D. Hubmayr (1949- ), W. Mark Brutinel (1948- ), and Paul D. Scanlon (1952- ) from the division of thoracic diseases & internal medicine, joined the CCS and Dr. Wochus resigned from the Mayo Clinic to enter

**Table 1.**  
Critical Care Medicine Fellows

Javier Aduen	Kevin S. Hara	Thomas J. Papadimos *
Bekele Afessa	Sharon Hargraves *	John Park
Robert Albright	Barry A. Harrison *	Ragunathan Parthasarathy
Robert M. Allen	Michael K. J. Hee *	Hemantkumar G. Patel
Alexander Allins	Monica A. Hennessy *	Samir K. Patel *
Ramzi Ammari	James T. Hynes	Prith Peiris *
Khalil Ansarin	Ashiqul Islam	Steve G. Peters
David A. Arrighi	Mohaim Ijaz	Gary C. Prechter
Yvonne Baerga-Varela	Ricardo Izurieta	Ourania Preventza
Ronald T. Bakondy *	Eric Jacobsohn *	Larry D. Price
Beth Ballinger	David Jawahar	Naga S. Pullakhandam *
Ashraf F. Banoub*	Thirumalairaj Jeevan	Natarajan Rajagopalan
Timothy J. Beaumont *	Scott S. Johnson*	Miguel Remolina-Schlig *
Robert E. Benkert	Bashar N. Jouma *	Thomas J. Rodenberg *
Keith H. Berge *	Luis Juncos	Frank D. Rossi *
Ines H. Berger *	Gerard S. Kamath *	Thomas A. Ryan *
Iqbal H. Biswas *	Ghassan E. Kanazi *	Nabel N. Saied *
Gilbert A. Blaise *	Mark T. Keegan *	Priya Sampathkumar
Glen Boudier	Farida Khan	John S. Sampson *
Alain Broccard	Youngmee Kim	Ambrish Shah
William T. Browne	Suneerat Kongsayreepong *	Joseph Shayeb
Peter D. Cameron *	Matthew M. Kumar *	Shawn T. Simmons *
Edmund G. Carton *	Tong K. Kwek *	Chanchai Sittipunt *
A. Cosmo Caruso	Joel S. Larson *	Kenneth G. Smithson *
Gilles I. Chemtob *	Panayota Liopyris *	Ann Steciw
Steven A. Conrad	J. Alberto Lopez	Susan K. Stein *
Mario L. Corona	Robert J. Lunn *	Kenneth H. Tan *
Dana Crino	Philip J. Lyng	Kamthorn H. Tantivitayatan*
Michael G. D'Souza *	Ian MacVeigh *	Mark Taylor
Maher Daas	Robert C. Maglio	Klaus D. Torp *
Lemsuel Dent	Syed Malik	Norman E. Torres *
Martin L. DeRuyter *	Steve Marks	Laurence C. Torsher *
Viren Desai	John C. McMichan *	William S. Turnage *
Gavin D. Divertie *	Diana P. Meadows *	Luis Urrutia
Elamin M. Ellamin	John Miller	Guringer M. S. Vasdev *
Scott A. Eskuri *	Syed Mobin	Dennis J. Verducci
James Y. Findlay *	Richard L. Morgan *	Robert W. Viggiano
Ognjen Gajic	Gamal Mostafa	Ravi Wahi *
Dorothee M. Gaumann *	Kamal F. Moukabary *	Maxwell Weinmann
John A. Gjevre	James J. Mulhall *	Jeffrey Wells
Monica Green *	Michael J. Murray	Lois Wise *
Brijendra Gupta	Elie Obeid	Frederick A. Zeller
Isam Habib	Okoronkwo U. Ogan *	Avishai Ziser *
John B. Hagan	Udaya B. Padakandla *	

\*Indicates Critical Care Medicine Anesthesiology Fellows

private practice. After completion of Dr. Marsh's term as director of the CCS, Dr. Divertie was appointed his successor in 1984.

The new method of government reimbursement for medical services, diagnostic related groups (DRGs) was beginning to have a negative impact on the bottom line of the Mayo Clinic's ability to care for critically ill patients, particularly those requiring prolonged ventilatory support. To try to control this, the CCS developed admission and discharge criteria for its units. A first attempt was made to evaluate illness severity scoring systems and their ability to predict clinical outcomes. This latter effort has continued and remains a prominent feature of practice

in intensive care since that time. Concern was expressed initially when the examination of these data began that, this evaluation might be used to limit care for some patients, but this fear has not materialized. Instead, outcome prediction scoring systems have proved invaluable in quality assurance studies. The institution made a commitment to commence performing liver transplants at the Methodist Hospital next year, and plans were developed to manage these patients in the intensive care units. Drs. Southorn and Plevak (Fig. 14), who were interested in taking part in this activity, participated in a series of interdepartmental meetings to formulate protocols governing the care of these patients. Finally,

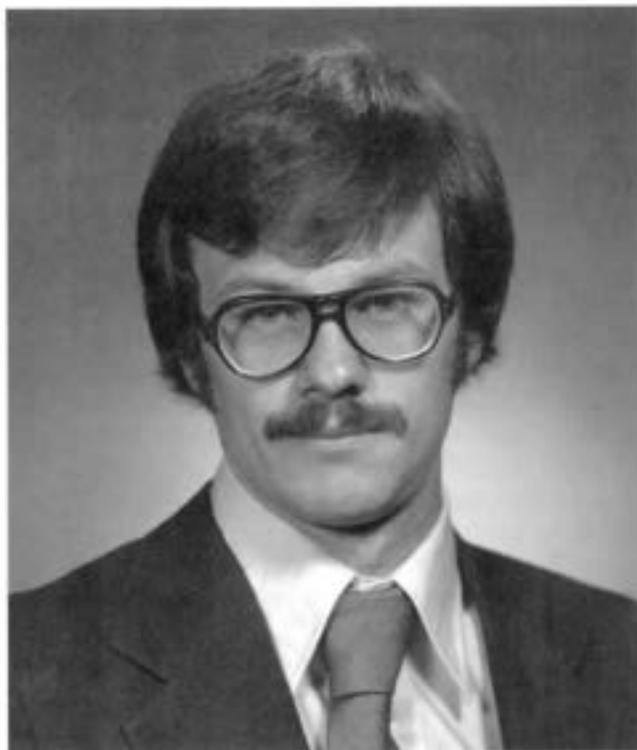


Fig. 14. Dr. David J. Plevak.

the success of the neonatal intensive care unit, now under the direction of Dr. Frederick Kleinberg (1940- ) from the department of pediatrics, resulted in requests from many smaller



Fig. 15. Dr. Steve G. Peters.

regional hospitals to transfer their critically ill, often premature infants to the Mayo Clinic facilities. To meet these requests, respiratory therapists needed to be part of the team used to transport these infants by helicopter. This service began to be fully operational in 1985.

Dr. Steve G. Peters (1953- ) (Fig. 15), from the division of thoracic diseases & internal medicine, joined the CCS in 1985. A major clinical event that affected the CCS in 1985 was, as predicted, the start of the liver transplant program. Drs. Southorn and Plevak headed the involvement of the CCS. A well-appreciated part of this practice was that the hepatologists and surgeons involved in the transplant program believed in the team concept. They wanted the critical care physicians to be in charge of the patient management when they were in the intensive care unit, either preoperatively or postoperatively. The care of these patients was challenging, involving several new departures in the practice, including close monitoring of the patient's coagulation status, immunosuppression, new ways to prevent infection, providing nutritional support, sustaining the patient's liver function, and when the occasion arose, monitoring and treating raised intracranial pressure to prevent neurologic injury. Since 1985, more than 1,000 liver transplants have been performed, and the institution has an outstanding record of success in this area. Dr. Plevak is still involved in this program and has become an internationally recognized authority in the critical care management of these patients. Dr. Hubmayr, who like Dr. Gillespie had conducted research in the pulmonary physiology laboratory of Drs. Hyatt and Rodarte before joining the CCS, commenced his studies on the alterations in pulmonary mechanics caused by pulmonary edema. Another addition of the resident syllabus text was written with everybody contributing under the direction of Dr. Peter Southorn. Dr. Russell A. Van Dyke (1930- ) began a 2-year appointment as medical director of the blood gas laboratory. In a further effort to control costs, the institution's clinical practice committee suggested that ordering and delivering chest physical therapy be standardized, and this suggestion was implemented.

### 5. Critical Care Subspecialty Boards and the Dawn of the Modern Era

From 1986, physicians started to join and leave the CCS with increasing frequency. To keep the text clear, the names of these physicians will be identified at the beginning of the paragraph(s) describing that year.

In 1986, Drs. Jay H. Rhu (1951- ) and Michael J. Krowka (1946- ), from the division of thoracic diseases & internal medicine, and Drs. Michael J. Murray (1949- ), Bradley J. Narr (1954- ) and Jeffrey J. Lunn (1952- ), from the department of anesthesiology, joined the service. Dr. Krowka left within a year to join Mayo Clinic Jacksonville.

The year 1986 marked several important crossroads in the development of the CCS. The most tragic event this year was the sudden and unexpected death of Dr. Divertie. He was a true and trusted colleague who gave exemplary service to the practice and for many years assumed a leadership role in it. With his death, leadership of the CCS passed to Dr. Gracey. In addition to those identified at the beginning of this chapter, Dr. Cortese rejoined the group for 1 year before leaving for Mayo Clinic Jacksonville. Many consultants were now available who could potentially rotate in CCS. At any one time, the units were staffed by three consultants from the division of thoracic diseases & internal medicine and by three consultants from the department of anesthesiology. In addition, two full-time equivalents were available for staffing the division of intensive respiratory care in the department of anesthesiology.

Negotiations among the various specialties represented on the American Board of Medical Specialties broke down in 1986 owing to what seemed, on the outside, petty quarrels. Each medical board completed its plans to offer its own sub-specialty examination at about this time. All anesthesiologists working in the CCS took the examination in 1986.

The new intensive care unit in 11-3 on the top floor of Methodist Hospital was opened, and work was begun with colleagues in the division of cardiovascular diseases & internal medicine to develop a new monitoring system for use in the ICUs being contemplated at Saint Marys Hospital in the Mary Brigh complex. Infection control, always a major concern, was specifically addressed in 1986. The division of infectious diseases & internal medicine had already identified a group of consultants who participated in the liver transplant program, and now other consultants in this discipline were becoming increasingly more involved in the management of other patients in the intensive care units. A collaborative working relationship was initiated with this division to formulate policies to reduce incidences of bacteremias related to indwelling vascular catheters. The paramedical staff began wearing scrub attire in 1986 to reduce the incidence of infection.

Perhaps provoked by the decision of the CCS laboratory to begin measuring serum calcium and blood glucose levels, the department of laboratory medicine and pathology succeeded in gaining institutional support that it should administer the CCS laboratories jointly with the department of anesthesiology. This decision was in line with what was occurring in other institutions, with departments of laboratory medicine seeking control of all laboratory procedures to ensure that these meet quality assurance standards required for laboratory accreditation. This joint administration has continued until the present time, although most of the responsibility involved in the day-to-day running of the laboratories and its cost center has been transferred to the department of laboratory medicine and pathology. In 1990 Dr. Paula S. Santrach (1955- ) from the department of laboratory medicine and pathology and Dr. Southorn were named codirectors of these laboratories. On the whole, this involvement of the department of laboratory medicine and pathology has been positive, with that department providing the resources to introduce new tests to improve the management of critically ill patients. These tests have included blood coagulation tests and the ability to perform quick turn around cardiac isoenzyme measurements to help expedite the detection of myocardial infarction.

Clinical research progressed in 1986. Dr. Murray had expertise in nutrition research and embarked on studies examining the nutritional requirements of critically ill patients. Drs. Gillespie and Hubmayr continued their studies of the changes in respiratory mechanics found in lung disease that necessitated mechanical ventilation and also those found in patients with pulmonary edema. Several studies were performed on the liver transplant patient population, with this effort being directed by Drs. Plevak and Southorn. Drs. Marsh and McMichan became involved in evaluating the new method of predicting clinical outcomes by the acute physiology and chronic health evaluation scoring system (APACHE). This system was based on 34 physiologic variables and making a subjective assessment of the severity of chronic intercurrent disease. The system was the most sophisticated prediction scoring system introduced to date. The APACHE system, which has undergone two subsequent revisions, is still utilized at the Mayo Clinic and nationally for quality assurance studies.

In 1987, Dr. James P. Contarato (1953- ) from the department of anesthesiology and Drs. Robert W. Viggiano (1952- ) and Charles W.

Drage (1937- ) from the division of thoracic diseases & internal medicine joined the service. Dr. McMichan moved to Mayo Clinic Scottsdale to head the section of anesthesiology at that facility.

Dr. Marsh resumed being the director of the CCS this year. In 1987, combined kidney-pancreas transplants were begun at the Mayo Clinic in Rochester, copying many of the techniques that had been learned from the liver transplant program. Protocols for performing best positive end-expiratory pressure studies were put into practice. The APACHE II prediction scoring system was now being used in all ICUs under management of the CCS. Responsibility for the respiratory therapy training program was transferred to the division of education within the department of anesthesiology. The CCS involvement in supervising cardiopulmonary resuscitation services was also terminated.

In 1988, Dr. Sten G. E. Lindahl (1945- ) and Dr. Robert A. Strickland (1952- ) from the department of anesthesiology and Drs. Eric S. Edell (1954- ) and Peter C. Gay (1954- ) from the division of thoracic diseases & internal medicine, joined the service, and Drs. Paul Didier and Conterato left it.

Dr. Paul Didier, decided to discontinue his involvement in critical care in 1988 and began working full time in the operating suite as an anesthesiologist. Paul Didier will be remembered in particular for shepherding and guiding the development of respiratory therapy profession. Dr. Plevak was named the new medical director of the respiratory therapy school. Planning began to establish the E. P. Didier Distinguished Lectureship to honor Dr. Didier's many contributions to the respiratory therapy profession to be held annually in Rochester during National Respiratory Therapy Week in the fall of each year. Dr. Sten Lindahl, a noted pediatric anesthesiologist from Sweden, who is now chairman of the department of anesthesiology at the Karolinska Hospital and deputy chair of the Nobel committee in Stockholm, Sweden and who had previously worked in Dr. Rehder's laboratory, joined the department of anesthesiology in 1988. Part of his responsibilities was to act as a facilitator for anesthesiologists to become more involved and lend their expertise to improving pediatric intensive care at the institution. Critical care service worked closely with him to accomplish this goal. Pediatric and neonatal intensive care units were areas of expansion of therapeutic modalities of care in 1988, including the use of nasal mask ventilation. The 6-Mary Brigh cardiac surgery intensive care unit at Saint Marys Hospital, built in part to accommodate

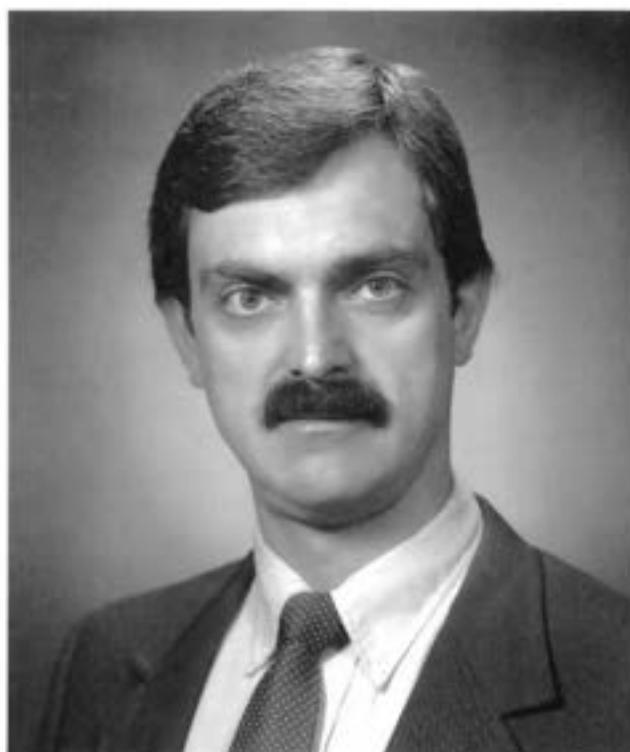


Fig. 16. Dr. Michael J. Murray.

patients undergoing heart and lung transplant surgery, opened in 1988. Drs. Peters and Rhu joined the group caring for the heart and lung transplant patients in this unit.

In 1989, Drs. William F. Dunn (1958- ) and Richard J. Pisani (1957- ) from the division of thoracic diseases & internal medicine, and Dr. Keith H. Berge (1958- ) from the department of anesthesiology joined, and Dr. Marsh left the service. Dr. Christopher M. Johnson (1952- ) was appointed director of the pediatric ICU.

In 1989, Dr. Roy F. Cucchiara (1943- ) assumed the chairmanship of the department of anesthesiology. Dr. Alan Sessler, his immediate predecessor and one of the founders of intensive care at the Mayo Clinic, had vigorously supported the development of intensive care throughout his tenure as chairman of the department. Dr. Michael Marsh, who was prominent in the development of the CCS, resigned in 1989 to become chairman of the department of anesthesiology at Henry Ford Hospital in Detroit, Michigan. Mike, a wise, kind, and intelligent person with natural leadership skills, had a special claim on the affection of all involved in critical care. Dr. Murray (Fig. 16) was appointed to complete Dr. Marsh's period as director of the CCS. At the request of the department of neurology to establish a critical care neurology section, Dr. Eelco F. M. Wijdicks (1954- ) started working on the CCS as

a special clinical fellow. Dr. Gracey obtained approval in 1989 to plan a six-bed unit in 2-Joseph at Saint Marys Hospital for the treatment of patients dependent on ventilatory support for more than 30 days. This unit was to be a Department of Health Care Finance Administration (HCFA) demonstration project, in which reimbursement based on cost was to be compared with that based on DRG basis. Dr. Gracey was to be appointed director of the unit, and his colleagues from thoracic diseases & critical care staffed the unit in his absence. The unit was established in 1990 and succeeded in getting HCFA financial support. Another change in practice in 1989, based on a government mandate for reimbursement, was that consultants had to countersign and code residents' notes of services rendered. The coronary care unit at Methodist Hospital closed and CCS assumed primary care of coronary care patients when they needed admission to an ICU in that hospital.

This period was the dawn of increasing subspecialization, which was to develop in the critical care service during the next decade. This change reflected a desire to assume more primary care responsibilities, particularly on the part of the colleagues from thoracic diseases. They started concentrating their efforts at Saint Marys Hospital to working in the medical ICU still located on the 3-Alfred unit, helping manage the heart-lung transplant patients, and working in the ventilator dependent unit set up by Dr. Gracey, which was soon to be called Graceland by everyone. At Saint Marys Hospital, the anesthesiologists in the CCS now directed their clinical time managing patients on the 4-Mary Brigh surgical respiratory intensive care unit and providing a consulting service to the neurosurgical unit. At the Methodist Hospital, the two specialties still rotated together in taking care of the patients. Dr. Southorn led some difficult but successful negotiations with leadership of the department of surgery for the critical care service to be the primary care physicians for surgical patients when they were admitted to ICU. This mode of practice lasted only a few years.

Starting various quality improvement initiatives became important events again in 1989. To reduce indwelling catheter-related bacteremias disposable pressure transducers were introduced for all hemodynamic monitoring. A Joint Commission for the Accreditation of Health Care Organizations inspection was passed successfully in 1989. The fellows in critical care began elective rotations to the Mayo Clinic facility in Jacksonville. Dr. Murray led an effort with Drs. Scanlon and Southorn to persuade a book pub-

lisher to market the latest version of the critical care in-house syllabus. This effort was ultimately unsuccessful. Multiple studies concerning the transplant patient population and work on the APACHE scoring system were continued, and the first of many protocols examining the acute respiratory distress syndrome in the modern era were begun.

In 1990, Dr. Edmund G. Carton (1955- ) from the department of anesthesiology joined the service. Dr. Murray was reappointed as director of the CCS in 1990 for a 3-year period. Dr. Scott E. LeBard (1956- ), an anesthesiologist with special qualifications in pediatrics, joined the staff of the pediatric intensive care unit, the first of several such appointments to what has become an exemplary sub-specialty. Members of the emergency room surgical service at Saint Marys Hospital made plans to become board certified in critical care and to establish their own surgical critical care service at Saint Marys Hospital. Responsibility for performing chest physiotherapy in the two hospitals was transferred to the department of physical medicine and rehabilitation. The hallmark in 1990, however, was the progress of the research effort. This progress included developing protocols on using surfactant to treat acute respiratory distress syndrome in adults, employing muscle relaxants in the ICU, using antitumor necrosis factor monoclonal antibodies to treat sepsis, and performing additional studies on the pulmonary mechanics in ventilator dependent patients, as well as numerous studies involving the transplant patient population. The service continued to gain a reputation for its academic prowess.

In 1991, Drs. Barry A. Harrison (1952- ) and Kevin P. Ronan (1956- ), from the department of anesthesiology, and Drs. Michael P. Bannon (1958- ) and Scott P. Zietlow (1957- ), from the department of surgery, joined the service, and Dr. Lunn left to work at the Mayo Clinic Scottsdale.

Dr. Duane K. Rorie (1936- ) became chairman of the department of anesthesiology in 1991. The new surgical ICU was opened at Saint Marys Hospital on the 7th floor of the Mary Brigh building in 1991. Drs. Bannon and Zietlow from the emergency room surgical service (ERSS) provided care in this unit. Dr. Berge was appointed director of the neurosurgical ICU at Saint Marys Hospital. HCFA implemented its resource board relative value scale (RBRVS) in 1991. The effect of this was to further reduce reimbursement provided by the government for patients needing prolonged hospitalization. It was indeed opportune that the 2-Joseph unit for ventilator dependent patients received HCFA approval as a

demonstration project this year. The first E.P. Didier Distinguished Lecture was given in the fall of 1991. New research projects that began in 1991 included examining an intravascular membrane oxygenator to help improve oxygenation of the arterial blood of patients with acute respiratory distress syndrome, a study to examine the benefits of recombinant human insulin-like growth factor on respiratory muscle strength, and ventilation weaning protocols using measurements of respiratory muscle strength and endurance. Multiple studies also continued on how to improve the practice of liver transplantation.

In 1992, Drs. Wijdicks and Jimmy R. Fulgham (1952- ), both from the department of neurology, joined the service and Drs. Ronan and Southorn from the department of anesthesiology left the service.

The directorship of the CCS reverted back to the division of pulmonary medicine in 1992, and Dr. Peters was elected to fill this position. The department of neurology appointed consultants to cover their sub-specialty component of critical care. The great tragedy that occurred this year was that Mr. Gilles, so instrumental in leading the efforts of respiratory therapy over the years, sustained severe head injuries in a car accident and was forced to retire. Bernie was known and admired by everyone, and he has been greatly missed. Mr. F. Curt Buck (1952- ), a CRNA, was appointed to succeed Mr. Gilles, and Dr. Narr was named medical director of respiratory therapy. Dr. Narr has worked diligently since then to find new avenues for respiratory therapists to work within the institution. This effort had been important to the department of anesthesiology, both because the new work performed by respiratory therapists has proved immensely valuable and because the traditional roles that respiratory therapists have had in patient care have suffered declining reimbursement in recent years. Examples of the new roles of respiratory therapists include their important contributions to the running of the clinical research unit at Saint Marys Hospital, participating in the preoperative medical evaluation clinic, and taking on such tasks as recording of electrocardiograms in the hospitals at nighttime.

In the years 1993 and 1994, Drs Martin L. DeRuyter (1959- ), Gerard S. Kamath (1956- ), and Dr. Matthew M. Kumar (1957- ) from the department of anesthesiology and Dr. John P. Scott (1956- ) from the division of thoracic diseases & internal medicine joined the service. Dr. Robert W. Viggiano left to work at Mayo Clinic Scottsdale.

Dr. Gracey became chairman of the division of thoracic diseases & internal medicine in 1994. The storm in the teacup, which surfaced at this time, was the decision of his division to change its name to division of pulmonary and critical care medicine & internal medicine. In this decision, they followed the example of many other groups practicing their specialty, but to some anesthesiologists it appeared to be the final nail in the coffin of a multidisciplinary critical care service. In truth, the latter was in fact becoming a thing of the past at the Mayo Clinic. The institution decided for administrative purposes to bring all the various specialties now involved in the practice of intensive care under the umbrella of this division at this time. As a result, the CCS comprised 29 physicians, of whom 9 were anesthesiologists, 11 were pulmonologists, 3 were surgeons, 2 were neurologists, and 4 were pediatricians. Each of these specialties sought to subspecialize in their special area of expertise. A practice pattern also now began to be established, which has continued to the present time of consultants rotating in and out of the CCS for short periods. An achievement during this 2-year period was the excellent dialog established with colleagues in the CCS of Jacksonville and Scottsdale. Mayo Clinic Jacksonville had a well-established CCS that was modeled after the one in Rochester, and Mayo Clinic Scottsdale was structuring a similar one. A research study on the effect of adding nitric oxide to the inhaled gas mixture in patients with acute lung injury and pulmonary hypertension commenced, as did studies led by Dr. Gay examining noninvasive respiratory support.

In 1995, Dr. Laurence C. Torsher (1959- ), Dr. Norman E. Torres (1961- ), and Dr. Gurinder M. S. Vasdev (1962- ), from the department of anesthesiology, joined the service.

In 1995, Dr. Narr (Fig. 17) became director of the critical care service. Several practice issues affected the running of the units at this time. These included the reduction in number of surgical residents in the institution required by their residency accreditation. Also, to meet third-party reimbursement requirements, the need for written documentation of services rendered to patients by the consultants increased. For the same reason, consultants increasingly had to be physically present and supervise clinical interventions performed by residents. Another issue that surfaced in 1995 again was the desire on the part of surgeons to direct the care of their patients received in the intensive care units. To facilitate patient care, a new patient information management system was ordered for the units.



Fig. 17. Dr. Bradley J. Narr.

The year 1995 also saw the introduction of the point-of-care hand held portable blood gas analyzer, which was used to provide blood gas analyses in cardiac arrest ("Code 45") situations.

From 1996 to 2000, Dr. Jeffrey J. Lunn, Dr. James Y. Findlay (1962- ), Dr. Daniel R. Brown (1964- ), Dr. C. Mark Bazzell (1959- ), and Dr. Bhargavi Gali (1967- ) joined, and Drs. Kamath, Torsher, Berge, and Strickland, all from the department of anesthesiology, left the service.

Although never static, the number of anesthesiologists in the critical care service has remained relatively constant during the last 5 years. In 1998, the directorship of this service rotated back from Dr. Narr to Dr. Peters, and Dr. Harrison was appointed chair of the division of intensive care and respiratory therapy within the department of anesthesiology. Currently, 30 consultants rotate through the units of the critical care service, of which 13 are anesthesiologists. Four full-time consultant positions are available for these anesthesiologists to work in critical care, and in addition, one full-time consultant position is available to support the activities of the respiratory therapists. Subspecialization within the CCS has now occurred. Currently, at Saint Marys Hospital, the anesthesiologists (Fig.



Fig. 18. Group photo of critical care anesthesiology consultants taken in May 1999 at a dinner honoring a return visit by Dr. Edmund G. Carton. Shown left to right are Drs. Daniel Brown, Michael Murray, Gurinder Vasdev, Edmund Carton, Barry Harrison, Matthew Kumar, Laurence Torsher, and Martin DeRuyter.

18) are responsible for providing this service to the vascular and thoracic surgery and neurosurgery intensive care units. Anesthesiologists still share responsibility for jointly directing the Methodist intensive care unit with colleagues from the division of pulmonary and critical care medicine & internal medicine. Anesthesiologists continue to have an educational responsibility to medical students, residents from the departments of anesthesiology, internal medicine and surgery, and CCS fellows drawn from the department of anesthesiology and internal medicine. In 1997, Dr. Murray's book entitled *Critical Care Medicine; Perioperative Management* was published and has become a standard text in this discipline.

Many clinical advances have been made in the care of critically ill patients. The last decade in particular has seen improvements in our ability to monitor vital signs of these patients, both in terms of obtaining information about physiologic variables in a less invasive fashion and being able to monitor them on a more continuous basis. The recent developments in point-of-care laboratory determinations, which bring the laboratory to the patient's bedside, should continue as well. Dramatic changes also have occurred in the treatment of various disease entities seen in the intensive care unit associated with the better understanding of the underlying pathophysiology. For example, the ventilatory support provided to patients with acute respiratory distress syndrome has dramatically changed in recent years. Simultaneously, with such innovations, improvements have occurred in the ability to provide appropriate nutrition to critically ill patients and to prevent iatrogenic infections.

Generations of physicians and nurses involved in critical care have been concerned about the distress that many patients experience while in this environment, and although improvements have been made over the years, progress is still needed in this area. The ability to relate disease severity and outcome has been helpful in patient management and quality assurance.

Currently, research by anesthesiologists in the CCS is focused on two areas. Drs. Murray and Harrison are leading the group examining the acute respiratory distress syndrome, while Drs. Plevak and Findlay continue to be involved in research directed at improving the care of patients who have undergone liver transplantation. Dr. Hubmayr from the division of pulmonary and critical care medicine & internal

medicine is conducting research at a molecular level examining alveolar cellular injury, and Dr. Gay from the same division is continuing his research into modalities for performing noninvasive respiratory support.

## 6. Conclusions

Since its inception, dramatic changes have occurred in the practice of critical care at the Mayo Clinic Rochester. Patients have undoubtedly benefited from these changes. Simultaneously, the multidisciplinary practice has been replaced by increasing subspecialization within this field of medicine. Third-party reimbursement issues are now prominent. Although, anesthesiologists with their training have much to offer in this discipline, their future involvement may be in jeopardy because they are not defined traditionally as primary care physicians. Many anesthesiologists in the CCS at the Mayo Clinic are board-certified both in internal medicine and in anesthesiology, which helps negate this perception. Organized anesthesiology at the institutional and national levels needs to support its members who wish to be involved in critical care. Dr. Murray has been active in this endeavor. In addition to being the initiators of this service at the Mayo Clinic, the anesthesiologists involved in it have made many valuable contributions. Intensive care should be supported by all anesthesiologists.

## 7. Post Note

This account of the department of anesthesiology's involvement in intensive care at the Mayo Clinic is based on interviewing people and reviewing the available records. In the care of patients, innumerable consultants and residents from almost every discipline at the Mayo Clinic have assisted the critical care service. To them and the superb nurses that work in the intensive care units, the respiratory therapists, dietitians, social workers, laboratory technicians and others involved in this activity, a tremendous gratitude is owed. Above all, thanks must be given to all the patients who allowed us to participate in their care. I trust that the events that unrolled in this story are accurately portrayed, but if there are errors, despite this chapter being reviewed by others, they are unintentional.

Peter A Southorn

## D. Orthopedic Anesthesia

The historical trend of developing subspecialty interest groups continues to the present within the department of anesthesiology at Mayo Clinic. This trend resulted long ago in the formation of subspecialty interest groups in cardiothoracic and neuroanesthesia. Somewhat later, subspecialty groups were formed in critical care, anesthesiology research, pain management, and transplant anesthesiology. Pediatric anesthesiology has been the most recent interest group to be organized. While pediatric anesthesia had a very effective advocate, teacher, and clinician in Brian Dawson (1927-1987), his tragic and premature death, in addition to the overall organization of the surgical practice within Saint Marys and Rochester Methodist hospitals, combined to slow the development of a pediatric anesthesia interest group.

### 1. The Early Years of Orthopedic Anesthesia

Important factors in the driving force behind the formation of subspecialty interest groups seem to have been an abundance of patients having similar operations and an unique expertise that is needed or helpful in the clinical management of these patients. The availability of information through research that would be helpful in managing the patient population always serves as an important impetus for subspecialty development. The more successful subspecialty groups in anesthesiology, as well as in other specialties at Mayo Clinic, have a strong research component. For orthopedic anesthesia, expertise in regional anesthesiology and the management of the clinical problems in patients undergoing orthopedic surgery are necessary assets.

Development of the subspecialty of orthopedic anesthesia at the Mayo Clinic lagged behind the formation of the specialty of orthopedic surgery by as much as 50 years. This lag is interesting because cardiothoracic anesthesia at the Mayo Clinic developed almost concomitantly with the development of cardiac surgery. Since the development of orthopedic surgery preceded that of cardiac surgery and the number of patients undergoing orthopedic surgery have always exceeded patients needing cardiac surgery, whatever was responsible for the delay in the formation of a subspecialty in orthopedic anesthesia did not relate to lack of patients.

According to *Orthopedic Surgery at the Mayo*

*Clinic 1910-1990, Supplement 1990-1999*, edited by Dr. Bernard F. Morrey (1943- ), the specialty of orthopedic surgery developed at the Mayo Clinic in 1910 when Dr. Melvin Henderson (1883-1954) was asked to establish an orthopedic surgery group. Development of this specialty derived from an increasing volume of complicated orthopedic problems consisting largely of fractures, osteomyelitis, bone tumors, and congenital deformities of the extremities. Detailed records that describe the early practice of orthopedic surgery or the anesthesia used are not available. In 1910, 595 orthopedic operations were done at Saint Marys Hospital. Orthopedic surgery was also done at the Chute Sanitarium and the Colonial Hospital. It was not until 1916 that surgical cases from the Colonial and Saint Marys hospitals were tabulated systematically. These records indicate that, by the early 1930s, about 1,500 orthopedic operations were being done each year. Surgical volume increased to about 5,000 by the end of the 1940s.

Interviews with former anesthesia personnel who have direct knowledge of this era of the anesthesia and surgical practice at the Mayo Clinic give some insight into the difficulties facing clinicians as they cared for these patients. Clearly, these were difficult patients to manage. There were no antibiotics until after World War II (1939-1945). Osteomyelitis was far more common. Amputations were also more common, which must have been an emotional drain on those caring for the patients. Even currently, when amputations are done, they seem to be the ultimate orthopedic surgical failure. Management of blood loss during surgery was an important and contentious issue. Flammable anesthetic agents prevented the extensive use of cautery to reduce blood loss. While tourniquets were used extensively to reduce blood loss during operations on extremities, they did not solve the problem. Dealing with surgical blood loss was always an important concern for those involved in the anesthesia care of orthopedic surgical patients during this phase in the department's history. As a result of these issues, anesthesia personnel at every level did not particularly like administering anesthesia to orthopedic surgical patients.

Faced with the predictable blood loss and confrontations over appropriateness of transfusions that occurred on a daily basis, and the obvious

improvement in patient care that would result if these issues were solved, it is easy to see the importance of the development of a technique by Dr. John S. Lundy (1894-1973) for preserving blood for as long as 14 days at the Mayo Clinic in 1935. This advance immensely benefited patients having orthopedic surgery and made anesthesia for orthopedic surgery a more attractive subspecialty for anesthesia care providers. Clearly, the concept of blood preservation is among Dr. Lundy's most important and lasting contributions to medicine, and this contribution has grown immensely in importance during the last 65 years.

During the chairmanships of Drs. Mark Coventry (1913-1994) from 1963 to 1974 and Edward D. Henderson (1919- ) from 1974 to 1982, the department of orthopedic surgery experienced great growths in patient volumes, innovations, and physician faculty. The department of anesthesiology grew substantially as well, during this period (Table 1).

During the era of the Coventry/Henderson chairmanships, orthopedic surgery at the Mayo Clinic and elsewhere also underwent significant changes. Adult reconstructive surgery grew significantly because of the introduction of effective innovations such as the Judet and Austin Moore hip prostheses and the introduction of proximal tibial osteotomy. The approval of methylmethacrylate in 1969 to secure hip and knee prostheses in the bones greatly expanded orthopedic surgical practice involving these two joints. Despite this, anesthesia for orthopedic surgery, as was the case with previous generations of anesthesiologists and nurse anesthetists, was still not a practice that was highly sought. Many young and talented anesthesiologists newly appointed to the department were assigned to orthopedic anesthesiology. But as Dr. Coventry once commented, they seemed to stay only until they found another place in the department to work.

In December 1971, Dr. Richard A. Theye (1923-1977) was appointed chair of the department of

anesthesiology at the Mayo Clinic. About a year later, he assigned himself to orthopedic anesthesia at Methodist Hospital. The reason for his decision is unknown but may have been driven, in part, by a desire to better understand the clinical practice issues in orthopedic anesthesia. Dr. Theye's decision was the first step in improving the work environment in anesthesia for orthopedic surgery. During the next few months several clinical studies were introduced. When and how much blood needed to be transfused was an issue, as it had been 35 years earlier when Dr. Lundy introduced the concept of blood preservation. Dr. Sheila M. Muldoon (1935- ), with the help of Dr. Nicholas G. Nolan (1939-1987) and members of the department of laboratory medicine and pathology, organized a study in which the blood volume of patients undergoing total hip arthroplasty was measured before and after completion of the surgical procedure. Measurements were made in patients of Dr. Coventry, who was supportive of clinical studies. The patients were found to have a deficit of about a unit of blood at the end of the operation even though all sponges had been weighed and every effort was made to replace fully all blood lost. This study showed how difficult it was to be certain about blood loss and replacement. At about the same time, Dr. Rungson Sittipong (1941- ) organized a study that showed inducing deliberate hypotension in patients undergoing total hip arthroplasty did not reduce operative time, blood loss, total blood transfused, or length of hospital stay. This study suggested that deliberate hypotension was not of value for this surgical procedure.

Another innovation of Dr. Theye was the introduction of a preoperative assessment clinic for orthopedic patients, which was located in the newly opened orthopedic surgery area on the 14th floor of the Mayo Building. While part of the impetus for this action may have come from the Residents' Review committee and the Joint Commission on Hospital Accreditation, the preoperative assessment clinic was helpful in

**Table 1.**  
Growth of Orthopedic and Anesthesiology Faculty Numbers

Year	Orthopedic surgical faculty	Orthopedic surgical procedures	Number of anesthesiology consultants	Total Mayo Clinic consultants
1962	15	2742*	18	360
1980	24	4327†	36	756
1988	26	8355*	58.5	937
1999	33	9121*	79	1228

\* Orthopedic Database (Includes surgical cases, cast room cases done with no anesthesia and cases done under local anesthesia).

† Anesthesiology Database (Includes only those cases needing the services of the department of anesthesiology).

improving relationships between the anesthesiologists and the orthopedic surgeons. This action also provided better care to the patients, and it improved the satisfaction of the anesthesiologists with the practice. The preoperative assessment clinic lasted about 5 years and was discontinued because of political and practical reasons.

Despite these developments, many anesthesia care providers still disliked providing anesthesia for orthopedic surgery. In addition to the issues associated with blood transfusions, another reason included difficulty intubating the trachea of many patients, especially those with rheumatoid arthritis. The patient population of 30 years ago had a far more advanced rheumatoid arthritis than is typically seen now. The fiberoptic intubating devices and intubating stylettes used currently to assist in intubation were not available. The so-called English airway assist device was available; nevertheless, the most commonly used technique for intubating the difficult airway was to thread a long intracath through the thyrohyoid membrane and pass it up through the larynx into the mouth. The catheter was passed through the endotracheal tube and was then used to guide the tip of the endotracheal tube into the larynx. Once the patient was anesthetized, positioning of patients having hip surgery followed. Only then could the preparation of the surgical field and subsequent draping be done. As expected, these procedures were lengthy in duration.

## **2. Orthopedic Anesthesia at Rochester Methodist Hospital, 1966 to Present**

In 1966, the lower eight floors of the current Rochester Methodist Hospital opened, including a new surgical suite with 31 operating rooms. Initially, five of these rooms and a cast room were designated for use by orthopedic surgeons. These new operating rooms allowed both the Colonial and Worrall hospitals to close their surgical areas and allowed the department of anesthesiology to consolidate its workforce exclusively in Saint Marys and Methodist hospitals.

In 1969, the Alfred building at Saint Marys Hospital opened, which increased the operating room capacity at Saint Marys Hospital and allowed neurosurgery to be transferred to Saint Marys from Rochester Methodist Hospital so that all neurosurgical operating rooms at the Mayo Clinic were at Saint Marys Hospital. The two operating rooms (30 and 31) vacated by neurosurgery at Rochester Methodist Hospital were assigned to orthopedic surgery. This change proved to be an excellent decision, because these

rooms were separated by a large anesthesia induction room complete with two gas columns and anesthesia machines. This induction room was well suited for performing regional anesthetics. Patients could be anesthetized and moved directly into operating rooms. Secondly, prior to the introduction of the constant motion devices, which slowly and continuously flex and extend the leg at the newly implanted knee joint, most patients with total knee arthroplasty had to return to the surgical suite for one or more brief anesthetics during which the range of motion at the knee joint was extended. These short anesthetics were also performed in this large induction room, which provided considerable efficiency into the practice. This was an ideal arrangement to teach medical students, residents, and student nurse anesthetists how to maintain an open airway in an anesthetized patient.

At Rochester Methodist Hospital, the operating rooms dedicated to the department of orthopedics remained the same from 1969 until 1988 when the north expansion of the surgical suite opened. At that time, all surgical activities of the department of orthopedic surgery moved to the new north expansion of the surgical suite, which had 10 operating rooms dedicated to orthopedic surgery plus a large suite for cast changes.

A major realignment of orthopedic surgery occurred in January 1992, when the adult reconstructive section of orthopedic surgery consolidated their practice at Rochester Methodist Hospital. This change placed much of the elective and joint replacement orthopedic surgery at Methodist Hospital. Dr. Robert L. Lennon (1940- ) transferred from Saint Marys Hospital with the orthopedic surgery group and became head of the orthopedic anesthesia section, a position he held until he resigned from Mayo Clinic in 1994. Dr. David L. Brown (1950- ) succeeded Dr. Lennon as head of the section of orthopedic anesthesia, serving until September 1997, when he resigned to become chair of the department of anesthesiology at the University of Iowa in Iowa City. Dr. Brown's clinical expertise and dedication to regional anesthesia were respected highly. He was appointed Editor-in-Chief of *Regional Anesthesia and Pain Medicine* in 1997. Dr. Terese T. Horlocker (1959- ) succeeded Dr. Brown, a position she continues to hold. In her clinical practice and research, she has been a very effective advocate for regional anesthesia. Her research with Dr. Denise J. Wedel (1952- ) has focused on neuraxial anesthesia and anticoagulation. Currently, she is a member of the board of directors of the American Society of Regional Anesthesia, as well as chair of the Food and Drug

Administration Advisory Committee on Anesthetic and Life Support Drugs.

### 3. Orthopedic Anesthesia at Saint Marys Hospital, 1969 to Present

When the Alfred Building opened at Saint Marys Hospital in 1969, it contained six new operating rooms on the same floor as the existing operating suite (plus shelled-in space for another three). Three of the newly opened operating rooms in the Alfred Building were assigned to the department of orthopedics. These three, plus the four operating rooms in the adjacent older surgical suite, meant that there were seven operating rooms plus a cast room dedicated to orthopedic surgery in Saint Marys Hospital. Anesthesia for orthopedic surgery at Saint Marys Hospital was the responsibility of Dr. John A. Paulson (1908-1994) until about 1970, when Dr. Virginia B. Hartridge (1919- ) succeeded him in this position. At that time, Dr. Paulson relinquished much of orthopedic anesthesia to her and took responsibility for providing anesthesia for urologic surgery. Dr. Hartridge believes that Dr. Paulson was the first anesthesiologist to lead an orthopedic anesthesiology interest group at the Mayo Clinic. In addition to her work in orthopedic anesthesiology, Dr. Hartridge was the medical director of the nurse anesthetist program at the Mayo Clinic from the 1950s to mid-1970.

In 1981, the current surgical suite in the new Mary Brigh Building at Saint Marys Hospital opened, at which time all surgical activity at the hospital moved to this location. Ten operating rooms plus two cast rooms were dedicated to the department of orthopedic surgery. The first anesthetics were given in the new suite on March 2, 1981. At that time, the section of anesthesiology at Saint Marys Hospital was headed by Dr. Sait Tarhan (1927- ) and consisted of 19 anesthesiologists, only 3 of whom are current members of the department. The section of orthopedic anesthesiology continued to be led by Dr. Hartridge until her retirement in April 1982. Dr. Paul F. Leonard (1926-1998) served as section head of the group from 1982-1987. He was well known for his interest in fire hazards and electrical safety in the operating room environment.

Dr. Wedel took over as section head in 1987. In 1988, the group was renamed the division of orthopedic anesthesia. Her enthusiasm for and expertise in regional anesthesia helped to spur a renewed interest in anesthesia for orthopedic surgery within the section. A post-residency fellowship in regional anesthesia at Mayo Clinic commenced about at this time; names of trainees

in this fellowship program are shown in Table 2. Under Dr. Wedel's leadership, the group published a text on orthopedic anesthesia in 1993. In addition to regional anesthesia research, Dr. Wedel has been active in research on malignant hypothermia. She was appointed editor for the section of regional anesthesia and pain management of *Anesthesia and Analgesia* in 1996. In 1995, Dr. Beth A. Elliott (1956- ) succeeded Dr. Wedel as chair of the division, a position she continues to hold. Dr. Elliott also has followed Dr. Hartridge's lead by also serving as medical director for the Mayo Clinic nurse anesthesia program.

The division of orthopedic anesthesia at Saint Marys Hospital has undergone considerable evolution since the orthopedic surgery department consolidated their adult reconstructive practice at Methodist Hospital. The addition of several orthopedic surgeons who specialize in surgery of the spine has led to the development of considerable expertise within the anesthesia group in the intraoperative management and monitoring of these complex surgical cases. The orthopedic trauma services maintain the highest utilization of any operating rooms within the surgical suite. Some of the operating rooms vacated by orthopedic surgeons moving to Methodist Hospital have been filled with thoracic and general surgeons. In response to this change in practice in the division, the name was changed to central division of anesthesiology in 1998 with the motto "We're not just ortho anymore!" Regional anesthesia and perioperative pain management continue to be a clinical and research focus of the group.

The subspecialty interest in providing anesthesia for orthopedic surgery remains strong within the department. The clinical areas in both hospitals are desirable places to work and attract the brightest of our young anesthesiologists. But now, they want to stay! While there is not a specific time or event to which one can point to as the turn-around time, the early 1980s are arguably the best time to pinpoint the transition to an excellent place to work.

Table 2.  
Regional Anesthesia Fellows

Scott R. Atchison Richard P. Goldman Jonathan S. Krohn Stephen J. Meyer Jessica A. Wolin
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Duane K. Rorie

## E. Acute Pain Service

The development of the acute pain service was a major step in the pain management services of the department of anesthesiology. Historically, in medicine, pain management often has been sub-optimal, partly because of the fear of inducing patient dependence or addiction to strong analgesics such as opioids. Many physicians, nurses, and scientists, however, have realized the importance of effective analgesia in patient care and worked to provide it. By the late 1970s and the early 1980s, newer analgesic regimens included patient-controlled analgesia for the intravenous administration of opioids, and the spinal-axis administration of opioids as well as local anesthetics. Members of the department of anesthesiology at the Mayo Clinic in Rochester have contributed significantly to the current clinical use of spinal-axis administration of opioids. Dr. Joseph K. Wang (1937- ) and Dr. Lee A. Nauss (1932- ) from the department of anesthesiology, together with Dr. Jürgen Thomas (1924- ) from the department of neurology, and Dr. Frederic W. L. Kerr (1923-1983) and Dr. Tony L. Yaksh (1944- ) from the department of neurosurgery were responsible for this innovative modality of pain treatment, which became accepted worldwide.

In 1974, the department of anesthesiology at the Mayo Clinic established the pain clinic, primarily for outpatients with acute or chronic pain. Drs. Nauss and Wang were the first two consultants, followed by Drs. Tim J. Lamer (1957- ), Peter R. Wilson (1941- ), Renee E. Caswell (1956- ), William J. Phillips (1959- ), and others. In the early 1980s, Drs. Beth A. Elliott (1956- ), David Robert Danielson (1952- ), and colleagues had introduced at St. Marys and Methodist hospitals patient-controlled analgesia by means of intravenous opioid administration for postoperative and trauma-related pain control. In 1982, Drs. Danielson, Glenn A. Fromme (1950- ), and Steven R. Rettke (1946- ) had initiated the epidural administration of opioids for analgesia in patients after thoracic or urologic surgery, and later for patients after vascular surgery. Dr. Denise J. Wedel (1952- ) and colleagues had introduced epidural infusions of local anesthetic agents for postoperative analgesia in some pediatric patients and some adults who had orthopedic surgery. Drs. Elliot, Scott R. Atchison (1953- ), and Wilson also provided some consulting services on a part-time basis for the management of pain in hospitalized patients. The value of these services and treatments became

apparent to surgeons and other physicians whose patients had benefited from pain management.

In early 1989, the department of anesthesiology was permitted by the board of governors of the Mayo Clinic to establish an acute pain service. This permission was in keeping with the development of such services at other medical centers. Dr. Roy F. Cucchiara (1943- ), chair of the department of anesthesiology, and Dr. Lamer, director of the pain clinic, asked Dr. Joseph M. Messick (1935- ) to plan an acute pain service. Dr. Messick accepted this challenge and formed a planning committee consisting of members from the department of anesthesiology, nursing services, and hospital pharmacies. With the cooperation of these departments, the establishment of nursing guidelines for the care, and monitoring of patients with spinal-axis analgesia or brachial plexus infusions, Dr. Messick and two anesthesiology residents began consulting service in July 1989. The acute pain service was available 24 hours a day both in St. Marys Hospital and Rochester Methodist Hospital. The goals of the acute pain service were multiple. The service offered optimal posttraumatic and postoperative pain management using spinal-axis opioids and analgesics, treated hospitalized patients with acute or chronic pain, and trained residents from the department of anesthesiology and later fellows of the pain management fellowship program in the management of pain. The acute pain service also taught the hospital personnel the fundamentals of modern pain management. Last, the acute pain service participated in clinical research studies.

By July 1989, patient-controlled analgesia was used extensively at the Mayo Clinic facilities. Consultants of the Mayo Clinic could order intravenous opioid administration employing this modality. Patients receiving local anesthetics by the epidural route could be cared for at any nursing station; admission in a critical care unit was not required. However, patients who had received opioids by epidural injection were initially hospitalized in an intensive care unit, because respiratory depression was considered to be a risk. It became apparent that epidural injection of opioids did not result in an increased rate of respiratory depression. By mid-1991, patients who had received opioids by the epidural route could be transferred directly from the postanesthesia care unit to a regular nursing station in the hospital. As a result, surgeons referred more patients to the acute pain service.

By the end of 1990, the acute pain service had cared for more than 2,300 patients. Nancy K. Schulte, RN (1951- ), had joined the acute pain service. With the help of Dr. Martin D. Abel (1952- ), a dedicated database had been established. This database included information about arterial blood gas values, treatment plans, and responses to treatment. Pain management infusion pumps were standardized. In 1994, patient-controlled epidural analgesia was introduced, an innovation that benefited many patients, including those having a thoracotomy.

From January 1, 1991, through December 31, 1995, 14,840 adult and pediatric patients had been cared for by the acute pain service. Of these patients, 84% received epidural infusions for postoperative pain management and 2% received brachial plexus infusions of local anesthetics. The remaining 14% were seen for other pain management problems. Nearly half of all patients had malignancies. The quality of pain relief was regarded as excellent-to-good for most patients, and the rate of unwanted side effects was low. In a patient satisfaction survey of 2,150 patients, 94% of the patients were very satisfied or satisfied with the service of the acute pain service.

All residents in the department of anesthesiology rotated through the service. In 1993, an anesthesiology pain management fellowship was approved, with Dr. Messick serving as the director. The first two fellows began their rotation in July 1994, and subsequently, fellows participated in the consultation practice of the acute pain service (Table 1).

In 1991, the acute pain service was combined with the pain clinic to form the division of pain services. Dr. Messick was appointed chair of this division. After Dr. Messick's retirement in 1997,

**Table 1.**  
Anesthesiology Pain Management Fellows At Mayo Clinic  
Rochester and Mayo Clinic Jacksonville Through June 2000

Evans E. Amune	Creston M. Martin
Steven M. Benenfeld	David P. Martin
Ines H. Berger	James P. Murphy
Richard L. Boertz-Marx	Thomas T. Nguyen
Jasmine A. Bowers	Conor W. O'Neill
Eric H. Busch	Susanne D. Pfeffer
John E. Carey	William J. Phillips
Paul E. Carns	Christopher A. Powers
Susanti K. Chowdhury	Jacqueline A. Proper
Kert R. Christensen	Dean M. Robinson
John D. Crecca	Renaud P. Rodrigue
Frank D. Crowl	Stephen R. Rogers
Melody F. Denham	David P. Seamans
Douglas A. Dubbink	Sondra E. Shields
Rodolfo Gebhardt	Steven M. Siwek
Kenneth B. Gossler	Pardeep K. Sood
John A. Hatheway	Terrence L. Trentman
Virgil A. Hilliard	Pamela G. Vick
Andrew R. Jaconette	Stephen Robert Wagner
Michelle A. Ochs Kinney	Carl M. Wagner
George Lederhaas	Jack L. Wilson
Carlos B. Mantilla	Gilbert Y. Wong

Dr. William James Phillips became the new division chairman, Dr. Jack L. Wilson (1960- ) became the director of the anesthesiology pain management fellowship, and Dr. Paul Edward Carns (1952- ) became the director of the acute pain service.

Essential for the success of the acute pain service were the support by members of the department of anesthesiology and the cooperative working relationships with the medical and surgical services, with hospital nursing staff, and with pharmacy personnel.

*Joseph M. Messick*

# IV. Development of Anesthesia At Mayo Clinics in Jacksonville and Scottsdale

## A. Mayo Clinic Jacksonville

### 1. Clinical Practice

In the 1980s, the trend in medical practice suggested that more care would be provided on a regional basis than on a national basis. This trend could have limited patient access to the Mayo Clinic Rochester from regions other than the Midwest. The Mayo Clinic responded by planning new sites for additional clinics. Because many Mayo Clinic patients spend the winter in Florida and Arizona, these regions were considered as strategic locations. A patient and major benefactor of the Mayo Clinic, Mr. James E. Davis (1907-1993), encouraged and supported the development of the Mayo Clinic Jacksonville in Florida. In 1986, the Mayo Clinic proceeded and completed construction of its first building, the Davis Building, in the middle of a pine forest near the Atlantic Intracoastal Waterway in Jacksonville and opened its first group practice outside of the Midwest with a staff of 35 physicians. Dr. Alan D. Sessler (1932- ), chair of the department of anesthesiology in Rochester, Minnesota, oversaw this project for the specialty of anesthesiology. He recruited from within his department two physicians, Dr. James V. Harper (1948- ) and Dr. Timothy S. J. Shine (1953- ), to provide anesthesia services. In September 1986, Drs. Harper and Shine moved to Jacksonville and made arrangements for the first anesthetic to be delivered 1 month later at St. Luke's Hospital, a 250-bed, 14 operating room, private community hospital at which the Mayo Clinic physicians had obtained privileges to work. St. Luke's Hospital had relocated 2 years before from an outdated turn-of-the-century building near the University Hospital to a new site in Jacksonville's sprawling Southside, approximately 8 miles west of the Davis Campus of the Mayo Clinic. The newly formed Mayo Clinic department of anesthesiology at St. Luke's Hospital consisted of the two founding anesthesiologists and four nurse anesthetists, Burdette V. Polk (1943- ), Linda Buck, (1952- ), Alicia Cassabar (1958- ), and Phil Klineschmidt (1954- ), all of whom had been recruited from Rochester, Minnesota. Community physicians,

including a private group of anesthesiologists, kept their privileges at St. Luke's Hospital and continued to provide anesthesia services for the majority of non-Mayo Clinic patients. The staff of the department cared exclusively for Mayo Clinic patients. The Mayo Clinic staff provided anesthetic services in the operating rooms, assisted in intensive care in the management of surgical patients requiring mechanical ventilation, and offered regional nerve blocks to patients with acute and chronic pain referred by colleagues.

The surgical patient volume of the Mayo Clinic Jacksonville grew rapidly within the first year of operation. As a consequence, Drs. Shine and Harper recruited additional consulting staff, first Dr. Lisa J. Vucalcic (1955- ) and then Dr. Jerry A. Dorsch (1946- ), who had been an anesthesiologist in private practice at another hospital in Jacksonville. One of Dr. Dorsch's areas of special interest was anesthesia equipment. His expertise was important in the timely implementation of state-of-the-art anesthetic and monitoring equipment at St. Luke's Hospital. Accompanying the rapid increase in patient numbers was an equivalent evolution in complexity of patient care that demanded a dedicated critical care service. To satisfy this need, Dr. Neil G. Feinglass (1957- ), a board-certified anesthesiologist and intensivist, was recruited in 1988 from Rochester, Minnesota, to establish a formal intensive care service. The following year saw the recruiting of Dr. David Mackey (1953- ), who had previously practiced at the University of Washington, Seattle. Dr. Mackey added special expertise in regional anesthesia and acute pain management and established an in-house acute pain service for Mayo Clinic patients.

In 1988, Dr. Harper was named chairman of the department of anesthesiology at Mayo Clinic Jacksonville. That year, St. Luke's Hospital became a Mayo Clinic affiliated hospital, with Mayo Clinic Jacksonville assuming St. Luke's Hospital corporate assets and liabilities. The hospital, however, remained open to community physicians, and by the end of the 1980s, anesthesia services at St. Luke's Hospital were split in nearly equal proportions between members of



**Fig. 1.** Members of the department of anesthesiology of Mayo Clinic Jacksonville in early 1992. From left to right, back row: Jean De Voss, CRNA; Lisa Beely, CRNA; Cindy Essick, CRNA; Eileen Keefauer, CRNA; Alicia Cassabar, CRNA; Valerie Sammett, CRNA; Bonnie Howe, CRNA; Burdette Polk, CRNA; Patti Pijut, CRNA; Danny Huffman, CRNA; Kathy Lessley, CRNA; John Shanko, CRNA; Michael Lessley, CRNA; Gavin Divertie, MD; James Harper, MD.

Front row: Tim Lamer, MD; Timothy Shine, MD; Jerry Dorsch, MD; Neil Feinglass, MD; Lisa Vucaicic, MD; David Mackey, MD. Not shown is Linda Buck, CRNA.

the Mayo Clinic department of anesthesiology and a group of private anesthesiologists.

Pursuant to the rapid development of comprehensive clinical anesthesia care, the department of anesthesiology at Mayo Clinic Jacksonville became the first to offer and establish a formal rotation for Mayo Clinic residents in anesthesiology outside of Rochester. Dr. Shine initially designed this integrated program with the assistance of Dr. Ronald J. Faust (1944- ), the anesthesiology residency director in Rochester. In 1988, Dr. Mark H. Ereth (1958- ) was the first resident of anesthesiology assigned to Mayo Clinic Jacksonville. A steady stream of residents and fellows, specializing in anesthesiology, critical care, and pain management, followed Dr. Ereth. A number of these residents and fellows subsequently joined the practice at Mayo Clinic Jacksonville. In 1990 Dr. Gavin D. Divertie (1956- ) was the first rotating resident to be so recruited from Rochester to assist Dr. Feinglass in providing intensive care.

In 1991, Dr. Tim J. Lamer (1957- ), director of the pain section in the anesthesiology department at Rochester, elected to relocate to Jacksonville to further the development of a comprehensive pain clinic. The composition of the department of anesthesiology by spring 1992 is depicted in Figure 1. After Dr. Lamer's arrival,

the practice of pain management grew rapidly in complexity and scope. In 1993, Dr. Lamer recruited Dr. Kenneth A. Marshall (1955- ) as a consultant in anesthesiology and pain management. Dr. Marshall had practiced anesthesia at the West Penn Hospital in Pittsburgh, Pennsylvania, and had completed a pain fellowship at Bowman Gray University School of Medicine in Winston-Salem, North Carolina. Dr. Marshall assisted Dr. Lamer in further developing the pain management program, including establishing a pain fellowship at Mayo Clinic Jacksonville, which has grown and become recognized by offering and regularly filling two positions. The pain clinic has evolved into a regional referral center for patients with complex pain problems.

In 1993, Dr. Gavin Divertie assumed the leadership of a newly formed and expanding department of critical care. This growth was facilitated by adding three internists, Dr. Charles Burger (1959- ) and Dr. Fred Zeller (1957- ) from Mayo Clinic Rochester, and Dr. Keith L. Stein (1957- ) from the University of Pittsburgh. In 1993, Dr. Divertie successfully initiated a critical care fellowship program.

The increased surgical load necessitated that St. Luke's Hospital increase its number of operating rooms from 14 to 19 in 1992. Even this expansion only temporarily met the needs. Following a national trend, the department anticipated and developed standards for outpatient anesthesia at Mayo Clinic Jacksonville. In 1995, Drs. Shine and Dorsch helped plan and develop a free-standing outpatient surgery center located on the Davis Campus, which opened in 1995. This state-of-the-art facility featured three operating rooms staffed by one anesthesiologist and three certified registered nurse anesthetists (CRNAs) or residents. The success of this outpatient surgery program was reflected in its rapidly growing number of patients (Table 1). It represented the Mayo Clinic's first dedicated outpatient anesthesia program, offering a unique educational opportunity for the Mayo Clinic anesthesia residents rotating from Rochester, Minnesota.

The year 1994 saw the arrival of Dr. Marie L.

**Table 1.**  
Evolution of Anesthesia Practice at Mayo Clinic Jacksonville \*

Year	Anesthesia staff		Surgeons	Cases	St. Luke's Hospital		OSC		OB cases	Transplant cases	Pain clinic cases	Comment
	MDs	CRNAs			ORs	Cases	ORs	Cases				
1986	2	4	13	243	14	243	-	-	-	-	20	Mayo practice enters St. Luke's Hospital
1987	4	5	17	2248	14	2248	-	-	-	-	172	Anesthesia residents start rotating
1988	5	7	20	2769	14	2769	-	-	-	-	244	St. Luke's affiliation with Mayo Foundation
1989	5	8	20	3174	14	3174	-	-	-	-	289	Critical care division formed
1990	7	10	24	3677	14	3677	-	-	-	-	301	Expansion of Mayo campus
1991	9	12	25	4073	14	4073	-	-	-	-	350	Division of pain management formed
1992	9	11	29	4286	19	4286	-	-	-	-	486	St. Luke's OR expanded
1993	11	13	32	4771	19	4771	-	-	-	-	620	Started planning for free standing OP surgery center
1994	12	14	33	5569	19	5569	-	-	-	-	849	Pain clinic expanded and moved to Joe Adams Building
1995	12	14	33	5905	19	5586	3	319	-	-	1243	OP surgery center opened
1996	11	14	36	6653	19	5201	3	1452	-	-	2571	Planning for liver transplant and obstetrics
1997	16	14	39	7833	19	5235	3	2598	390	-	3716	OB anesthesia program started
1998	16	20	42	8064	19	5297	3	2767	657	54	4234	Liver transplant program started
1999	22	28	49	8951	19	5928	4	3023	1163	97	4196	Planning for heart, lung, kidney, pancreas transplant programs
2000	20	30	51		19		6					Heart, lung, kidney, pancreas transplant programs started

\* MD, medical doctor; CRNA, certified registered nurse anesthetist; OR, operating room; OSC, outpatient surgery service; OB, obstetrics; and OP, outpatient

DeRuyter (1962- ). In 1996, Dr. DeRuyter became assistant residency director, a role previously held by Dr. Divertie. In 1994, a proposal to the Residency Review Committee for Anesthesiology of the Accreditation Council for Graduate Medical Education to establish a separate anesthesiology residency program was denied. This decision was reached, largely because of the perceived lack of need for additional anesthesia providers to meet national needs. As a consequence, Mayo Clinic Jacksonville continued its role as part of an integrated residency program centered in Rochester.

Dr. Jerry A. Hall (1963- ) a former Mayo Clinic resident, joined Mayo Clinic Jacksonville in 1996, coming from the University of Virginia, Charlottesville. His main interest was pain management in which he made significant contributions to the clinical practice. Dr Hall resigned from Mayo Clinic Jacksonville in 1999 to pursue a private pain practice in Kansas City, Missouri.

The years from 1996 to 2000 were perhaps the most turbulent times for the department. In 1996, Dr. Harper resigned as chair of the department of anesthesiology and was succeeded by Dr. Tim Lamer. Dr. Lamer oversaw a period of dramatic changes, brought about in part by the addition of a number of new services in rapid succession, as well as the assimilation of the private group of anesthesiologists at St. Luke's Hospital into the Mayo Clinic's department of anesthesiology. The three members of this private group were Dr. Claudia C. Crawford (1950- ), a gradu-

ate of the University of Miami; Dr. John J. Doyle (1957- ), a graduate of the University of South Florida in Tampa; and Dr. Salim M. Ghazi (1962- ), a graduate of Duke University in Durham. With their addition, the Mayo department became responsible for all surgical cases performed, in an ever-increasing number, at St. Luke's Hospital. Additional staff recruited to this end included Drs. B. Todd Sitzman (1964- ) and Perry S. Bechtle (1961- ). Dr. Sitzman, from the University of Virginia, Charlottesville, joined Mayo Clinic Jacksonville in 1997 to work in the operating rooms and pain clinic. When the liver transplantation program was established in 1998, he joined Dr. Wolf H. Stapelfeldt (1958- ) in providing liver transplant anesthetic services while still remaining an active member of the pain clinic. Dr. Bechtle had completed his residency at Mayo Clinic Jacksonville in 1996, followed by a neuroanesthesia fellowship in Rochester under the direction of Dr. William L. Lanier (1955- ). Dr. Bechtle returned to Mayo Clinic Jacksonville in 1997, to establish a formal neuroanesthesia service, which was by that time in great demand.

In 1997, cardiovascular and thoracic anesthesia was enhanced by the establishment of an intraoperative cardiac echocardiography service (TEE), directed by Drs. Feinglass, Shine, and Crawford. They were among the first anesthesiologists to be certified by the national board of echocardiography during its inaugural examination in 1999.

In 1997, an obstetric service was also established at St. Luke's Hospital and the department of anesthesiology developed an obstetric anesthesia service. To this end, Dr. Christopher F. James (1950- ) was recruited from the University of Florida, Gainesville, to provide expertise in the anesthetic management of obstetric patients and in pain relief by continuous spinal or epidural analgesia. Since the inception of this service, the number of deliveries has continued to increase, and by June 1999, the number reached a monthly average in excess of 100 deliveries. This increase in workload required the addition of two additional obstetric anesthesiologists, Dr. Lori A. Dangler (1964- ) in 1998 and Dr. Doris R. Wang (1967- ) in 1999, both graduates of the University of Florida, Gainesville, with subspecialty interests in obstetric and regional anesthesia. Increased activity and complexity of cases has culminated in the establishment of an obstetric anesthesia fellowship, effective July 2000.

Finally, when a liver transplant certificate of need was approved by the State of Florida, Dr. Wolf Stapelfeldt was recruited from the Thomas E. Starzl Transplantation Institute in Pittsburgh to direct the Mayo Clinic Jacksonville transplant anesthesia program, which began to function in February 1998. The initial goal was to perform 15 liver transplants during the first year of operation. Instead, 75 cases were completed, and Mayo Clinic Jacksonville quickly became one of the top 10 liver transplant centers in the United States, pioneering the fast-tracking of liver transplant patients. Dr. Stapelfeldt was joined by Drs. Todd Sitzman and Salim Ghazi and was assisted by Michael A. Geisler (1952- ), a certified registered nurse anesthetist (CRNA), to form a dedicated transplant anesthesia care team charged with developing and delivering anesthetic services for organ transplantation, including kidney and pancreas transplantations, both of which



**Fig. 2.** Members of department of anesthesiology of Mayo Clinic, Jacksonville in mid-1999. From left to right, back row: Perry Bechtle, DO; Danny Huffman, CRNA; Todd Sitzman, MD; Salim Ghazi, MD; Bruce Leone, MD; Lori Dangler, MD; Kenneth Marshall, MD; William Spartrisano, CRNA; David Brown, CRNA; Michael Geisler, CRNA; Paul Hassfield, CRNA; Michael Stidham, CRNA; John Doyle, MD; Tim Lamer, MD; Christopher James, MD; Thomas Rodenberg, MD; Dee Lichty, CRNA; Wolf Stapelfeldt, MD; Neil Feinglass, MD; Timothy Shine, MD; Sandra Simonson, CRNA; Hayward Risser, CRNA; Dennis Simonson, CRNA.

Front row: Pamela Washkat, CRNA; Kim Rice, CRNA; Rhonda Gruber, CRNA; Marie DeRuyter, MD; Nancy Dalton, CRNA; Elizabeth Hick, CRNA; Claudia Crawford, MD; Vicky Stidham, CRNA.

Not shown are Jeannie Alexander, CRNA; Jack Coin, MD; Jerry Dorsch, MD; Jeffrey Dungan, CRNA; Jerry Hall, MD; Amy Igel, CRNA; Peggy James, MD; Claude Kluck, CRNA; Kathy Lessley, CRNA; Michael Lessley, CRNA; David Mackey, MD; Marvesh Mendhi, CRNA; Rhonda Mostovych, CRNA; Burdette Polk, CRNA; Charlotte Pumphrey, CRNA; Wynn Redmon, CRNA; Tammy Sarab, CRNA; Rom Stevens, MD; Doris Wang, MD; Jimmie Williamson, CRNA; Vivian Vignetti, CRNA.

received final approval by the State of Florida in early 2000.

In 1998 and 1999, four more anesthesiologists joined the practice: Drs. Rom Anthony Stevens (1956- ), Thomas J. Rodenberg (1959- ), Bruce James Leone (1957- ), and Peggy James (1946- ). Dr. Stevens joined the department after completing a sabbatical leave in Lucerne, Switzerland. His interest was in regional anesthesia and pain management. Dr. Rodenberg joined the departments of anesthesiology and critical care medicine after completing a critical care fellowship in Jacksonville and Rochester. Both colleagues resigned from Mayo Clinic Jacksonville within the following year. Dr. Leone had relocated from Duke University, Durham, North Carolina, where he had held a faculty position and directed a cardiovascular physiology research laboratory. Upon joining Mayo Clinic Jacksonville, he developed an interest and expertise in operating room management and was appointed medical director of St. Luke's Hospital

operating rooms. In 1999, Dr. Peggy James, Dr. Christopher James' wife, joined the practice in anesthesia for general surgery. Previously, she had practiced at the Veterans Affairs Medical Center of the University of Florida, Gainesville.

The growth of the clinical practice was paralleled by a commensurate growth of the CRNA group, from an initial 4 CRNAs in 1987 to 36 in 1999. The CRNA group was initially led by Burdette Polk, followed in 1991 by Linda Buck, and finally, since 1998, by Mr. Geisler, who had relocated from Rochester to participate in the organization of the liver transplant anesthesia program. Members of the department of anesthesiology as of the middle of 1999 are shown in Figure 2.

The immediate future will likely bring continued growth as a consequence of the immense population growth in northeastern Florida, the granting of a certificate of need for heart and lung transplantation, immediate plans for living-related donor liver transplantation, and recently approved applications for pancreas and kidney transplant programs.

## **2. Educational and Professional Activities and Achievements**

Resident rotations to Jacksonville began as early as 1988, initially coordinated and organized by Dr. Shine, and after 1993, by Dr. Divertie. In 1995, Dr. Marie DeRuyter became coordinator, also working with education services of the department of anesthesiology at the Mayo Clinic Rochester and overseeing resident rotations at Mayo Clinic Jacksonville. By 1998, residents rotated in obstetric anesthesia, outpatient anesthesia, multispecialty anesthesia, general surgery, cardiothoracic anesthesia/TEE, liver transplant anesthesia, pain clinic, and critical care. In addition to resident rotations, formal fellowships have been offered in pain management (1993), critical care (1994), cardiothoracic anesthesia/TEE (2000), and obstetric anesthesia (2000), directed by Drs. Marshall, Divertie, Feinglass, and James, respectively.

The academic interest at Mayo Clinic Jacksonville has been largely focused on technology-related issues in anesthesia. Dr. Dorsch has authored a major textbook entitled *Understanding Anesthesia Equipment*. In 1992, he presented a refresher course entitled *Anesthesia Equipment Update*, which has since been held annually in Orlando, Florida. In the early 1990s, Dr. Harper developed an intraoperative anesthesia record-keeper that was installed in St. Luke's Hospitals operating rooms and subsequently brought to the marketplace, with considerable commercial success. After Dr. Harper's departure from Mayo Clinic Jacksonville in 1996, the department's involvement with the electronic environment continued. In 1998, Dr. Feinglass assumed a leadership role as anesthesia liaison in the development of Surginet, an integral component of the CERNER Corporation Millennium software concerned with all management aspects of the surgical suite, including preoperative, intraoperative, and postoperative anesthesia care. In this capacity, Dr. Feinglass was a founding member and has a joint appointment in the newly formed department of applied informatics at Mayo Clinic Jacksonville.

Dr. David Mackey developed an interest and expertise in issues concerning organized medicine. In 1999, Dr. Mackey was elected president of the Florida Society of Anesthesiologists. In this capacity, Dr. Mackey has had a major role in establishing regulations governing anesthesia for office-based surgery in the State of Florida. Dr. Mackey is also scheduled to host the Year 2000 Pain Society Annual Meeting in Orlando, Florida.

In 1998, Mr. Geisler (CRNA) was named Clinical Practitioner of the Year, by the American Association of Nurse Anesthetists, after being selected among 26,000 peers nationwide for his professional contributions.

*Timothy S. J. Shine  
Wolf H. Stapelfeldt  
Neil G. Feinglass*

## B. Mayo Clinic Scottsdale

In the early 1980s, the Mayo Clinic questioned the apparent isolation of Rochester, Minnesota, from centers of population growth and decided to establish Mayo Clinics in Jacksonville in Florida and Scottsdale in Arizona.

Mayo Clinic Scottsdale, located on land in the far northeast of Scottsdale, opened for patient care in June 1987 (Fig. 1) Forty physicians, mostly from Mayo Clinic Rochester, were recruited initially to create an integrated subspecialty clinical practice under the leadership of Dr. Richard W. Hill (1927- ). The facility initially comprised 120 examination rooms, some non-surgical treatment and procedure rooms, two operating rooms for outpatient surgical procedures, medical laboratories, a radiology suite, and an advanced satellite telecommunications system.

### 1. Clinical Practice

#### *Growth of Clinical Practice and Consulting Staff*

The first members of the anesthesiology section were Drs. John C. McMichan (1941- ) and Jesse J. Muir (1949- ), both from Mayo Clinic Rochester and Dr. Kent P. Weinmeister (1950-), a graduate of the Mayo Clinic anesthesiology residency program who had been in private practice in Illinois. Dr. McMichan was appointed head of the section.

These consultants provided anesthetic care for patients in three locations; namely two of the community-based hospitals of the Scottsdale Memorial Hospital system and the outpatient surgical facility at the Mayo Clinic. At that time,

Scottsdale Memorial Hospital - North had four small operating rooms for ear, nose and throat, general, gynecologic, orthopedic, and urologic surgeries. Cardiac, neurologic, thoracic, and vascular surgeries were performed at Scottsdale Memorial Hospital - Osborn. Outpatient cosmetic and some urologic surgery and eye surgery were performed at the Mayo Clinic building. Some other outpatient surgery was carried out at the Piper Center, the ambulatory surgery center of Scottsdale Memorial Hospital - North.

By 1989, growth in the Mayo Clinic's surgical workload necessitated that Scottsdale Memorial Hospital - North build six additional operating rooms. This construction permitted the anesthesiology section to consolidate their hospital-based work to this one hospital. New anesthesiology consulting staff was also recruited to cover this increased patient volume. These included Dr. Kurt E. Springmann (1955- ), who joined in 1988 and Dr. Mark R. Mathews (1955- ) in 1989. In 1990, Dr. Sharon R. Johnston (1959- ), joined the staff. Dr. Karen Campbell Spaccarelli (1960- ) joined in 1991, Drs. Jeffrey J. Lunn (1952- ) and Joel S. Larson (1957- ) joined the staff in 1992, Dr. David J. Crecca (1961- ) in 1993, and Dr. Joseph G. Weber (1962- ) in 1994.

In 1992, Dr. McMichan relinquished his position as section head and Dr. Lunn was named his replacement. This transfer coincided with anesthesiology being designated a department rather than a section within the institution.

In 1994, construction of four additional operating rooms began at Scottsdale Memorial Hospital - North to accommodate the ever-increasing sur-



Fig. 1. Mayo Clinic Scottsdale.

gical volume. Two of these rooms were opened in 1994 and the other two rooms in 1996. These new operating rooms were large multipurpose rooms that could be used for any type of surgery but were primarily used for orthopedic surgery.

In the next 5 years, a number of consultants resigned from the consulting staff and others were recruited. Dr. Springmann resigned in 1989, and Dr. Mathews in 1991, Dr. Johnson in 1992, and Dr. Spacarelli in 1994. They were replaced by Dr. Froukje M. K. Beynen (1938- ), a specialist in cardiovascular and pediatric anesthesia, Dr. Leslie Newberg Milde (1943- ), an expert in neuroanesthesia, education, and research, Dr. Renee E. Caswell (1956- ), with special expertise in pain management, and Dr. John B. Leslie (1952- ), another specialist in cardiovascular anesthesia and experienced in research.

In 1997, Dr. Lunn stepped down as chairman of the department and returned to Mayo Clinic Rochester. Dr. Milde succeeded Dr. Lunn as chairperson. By this time, building a Mayo Clinic hospital had become an objective of the institution, and in preparation for this, new consulting staff were again recruited. These were Dr. Jeff T. Mueller (1963- ), who had expertise in anesthesia for transplantation surgery, Dr. Karl A. Poterack (1961- ), a specialist in neuroanesthesia, Drs. Terrence L. Trentman (1962- ), and David Seamans (1953- ), both experts of pain management, and Dr. Peter E. Frasco (1961- ), who had a special interest in anesthesia for cardiovascular and transplantation surgery and transesophageal echocardiography.

#### *Nurse Anesthetists*

In 1988, the model of an anesthesia care team was adopted at Mayo Clinic Scottsdale. This model was a fairly novel concept for the Phoenix area, where most anesthesiologists practiced without nurse anesthetists. The first certified registered nurse anesthetists (CRNA) to join Mayo Clinic Scottsdale were Pauline C. Bisel (1944 - ) and Jack Hostak (1935 - ), both from Mayo Clinic Rochester. Some time was needed for these two CRNAs to secure privileges at Scottsdale Memorial Hospital - North. In the interim, they performed preoperative evaluations and provided sedation for outpatient procedures performed at the Mayo Clinic building. In mid-1989, they did obtain their hospital privileges, but Scottsdale Memorial — North demanded the work of each nurse anesthetist to be supervised by one physician, a very inefficient use of personnel. Subsequently, the ratio of supervising physician to nurse anesthetist was allowed to increase to 1:2 in 1990 and in 1995 to 1:3. With time, the

number of CRNAs increased to 25 full-time equivalents. Pauline Bisel was the first CRNA supervisor; a position she kept for approximately 10 years.

In 1997, Jane Brady became the new CRNA supervisor. She was instrumental in designing, together with the department's administrator, Karen Biel, and Dr. Milde and her consultant colleagues, the new surgical suite at the Mayo Clinic Hospital. In 1999, Bernadette Miller became the CRNA supervisor. With the increase in the size of the clinical practice and in the numbers of CRNAs, Jane Brady and Barbara Hadley were appointed as CRNA facilitators to coordinate the day-to-day activities of nurse anesthetists.

#### *Anesthesia Technicians*

At Scottsdale Memorial Hospital - North, anesthesia technicians assisted anesthesiologists with regional anesthesia, difficult endotracheal intubations, and placements of arterial and venous catheters. They also maintained the anesthesia equipment, kept adequate supplies, trained allied health personnel in the use of anesthetic equipment, and operated the cell-saving equipment and the rapid infuser. This work of the anesthesia technicians proved to be so useful that the decision was made to recruit and employ anesthesia technicians at the ambulatory surgery center of the Mayo Clinic and subsequently the Mayo Clinic Hospital. Michael L. Crowell was appointed as supervisor of these Mayo Clinic anesthesia technicians. He in turn added four additional anesthesia technicians and two anesthesia patient care assistants to the team.

#### *The Ambulatory Surgery Center*

In 1990, Mayo Clinic Scottsdale began construction of an addition to the outpatient facility, which included an ambulatory surgery center. This center, which opened in 1992, consisted of five operating rooms, a preoperative area, a postanesthesia care unit, space for offices, a conference room, and a room for other support functions. This facility was the first freestanding ambulatory surgery center in the Mayo Clinic practice.

In the design of the ambulatory surgery center, careful attention was paid to provide as much comfort as possible in the preoperative area and recovery room to patients, members of their families, and friends. Nurses were specially trained in the care of these outpatients. The increase in the surgical volume associated with the opening of the ambulatory surgery center in part explains the additional need to recruit additional staff anesthesiologists and CRNAs.

### ***The Pain Clinic***

With the opening of Mayo Clinic Scottsdale, Drs. Weinmeister and Muir began treating patients who had acute postoperative pain, chronic pain, or cancer pain. They treated both hospitalized patients and outpatients, the latter being seen on the second floor of the Mayo Clinic building. In 1992, a pain clinic with examination/consultation rooms, procedure rooms, and support space was created adjacent to the ambulatory surgery center. This proximity allowed nurses from the preoperative area, the postanesthesia care unit, and surgery center to participate in the care of patients requiring pain management. Dr. Weinmeister was appointed as the first head of section of the pain clinic, and Dr. Muir succeeded him in this position in 1997. Currently, the staff of the pain clinic comprise Drs. Caswell, Seamans, and Trentman in addition to Drs. Muir and Weinmeister.

In 1999, the pain clinic performed 6,000 procedures and its staff provided approximately 1,900 consultations. The consultants also performed invasive procedures in the hospital in collaboration with neurosurgeons. Such procedures included implantation of epidural or intrathecal catheters, implantation of neurostimulator electrodes, epiduroscopy, and radiofrequency neuroablations.

### ***The Preoperative Medical Evaluation Clinic***

Preoperative medical evaluations (POME), including routine diagnostic tests, are performed in the POME clinic for patients who do not have a primary care physician at the Mayo Clinic. Patients are also prepared for their postoperative experience. In January 1996, the preoperative medical evaluation clinic opened. At first, Dr. Larson was the only staff physician working in this area. Gradually, he was joined by other members of the department, and currently all members of the department participate in preoperative medical evaluations.

In November 1997, Dr. Susan G. Hagstrom (1962- ), a board certified internist was appointed medical director of the POME clinic. Her contributions have added a new dimension to patient care provided by the anesthesiology department. Not only do the preoperative medical evaluations address the needs of the anesthesiologists but also interventions are made to ensure that the patients are in optimum condition for the surgery, anesthesia, and their postoperative recovery. At the present time, the POME clinic is in the process of increasing its scope of practice to include triage and medical evaluation of all surgical patients and nursing assessment of patients



**Fig. 2. Atrium of Mayo Clinic Hospital.**

requiring hospital admission. Dr. Swarna Chaliki, also board certified in internal medicine, and Bill M. Religio, a physician assistant, were recently added to the staff of the POME clinic.

### ***Mayo Thunderbird Clinic***

In 1997, the Mayo Center for Women's Health opened at the Mayo Thunderbird Family Practice Clinic in north Scottsdale. This clinic has an extensive program for in-vitro fertilization, a procedure requiring the services of the department of anesthesiology, thus adding one more location for anesthesia delivery.

### ***Critical Care***

In January 1997, Drs. Lunn and Larson founded the department of critical care. The critical care unit at the new Mayo Clinic Hospital has two 10-bed pods for patients who require critical care and an additional 10-bed pod for patients who need intermediate care. The department of critical care has continually grown, and in addition to the chairman, Dr. Larson, its staff include Drs. Richard A. Helmers, Dr. Daniel J. Johnson, Dr. Blavesh M. Patel and Dr. Moshamed Y. Rady. Residents from the departments of anesthesiology, family medicine, internal medicine, and surgery, as well as fellows from the department of critical care, now receive training by the department of critical care.

### **Medical Director of Perioperative Services**

In June 1998, Dr. Leslie was named medical director of perioperative services. Such a position exists in most other medical institutions in the United States but is unique in the Mayo Clinic system. The medical director of perioperative services organizes scheduling, manages central supply, and analyzes operating room cost and utilization. The last mentioned responsibility is an effort to ensure efficient use of personnel and equipment and to provide optimal quality of care to patients.

### **Mayo Clinic Hospital**

In 1995, Mayo Clinic Scottsdale purchased state land in northeast Phoenix to build a hospital—the first hospital ever planned, designed, and built by the Mayo Clinic. The hospital started receiving patients in October 1998. The hospital was designed to provide a patient and visitor friendly environment, while at the same time maximizing efficiency of care. The hospital provides spacious private rooms with a view of either the five-story atrium (Fig. 2) or the outside desert landscape (Fig. 3). Medical service areas with similar functions are located near one another. Nurses working in a unit are within 20 steps of any room. The hospital is wired such that any patient may receive cardiac telemetry. Modern facilities for the department of emergency and



Fig. 3. Mayo Clinic Hospital.

urgent care, clinical laboratories, diagnostic imaging, and cardiac testing and for outpatients with cancer are provided. The surgical suite includes 14 operating rooms, a preoperative area, eight procedure rooms, a postanesthesia recovery unit, and a 23-hour observation unit. A pharmacy, postoperative roentgenogram room, and surgical pathology laboratories are adjacent to the surgical suite.

The 23-hour observation unit has 18 rooms for outpatients or for patients who require less than 24 hours of hospitalization. Computerized monitors at each preoperative and postanesthesia recovery unit bay and in the operating rooms allow data entry while the caregiver is with the patient. Immediate access is available to the patient's entire medical record, including the latest information of laboratory test results, treatment plans, and patient's progress, and filmless imaging allows immediate access to roentgenograms at the bedside.

Under the direction of Karen Biel, director of perioperative services, Dr. Milde, chair of the department of anesthesiology, and Jane Brady, CRNA supervisor, and with the help of all members of the department, a state-of-the-art operating suite was designed and developed. The suite utilizes modern anesthetic machines, monitoring equipment, drug infusion and rapid infusion pumps, echocardiography machines, and bronchoscopes. Ancillary carts were designed, providing easy access to equipment for treatment of malignant hyperthermia, latex allergies, difficult endotracheal intubations, regional anesthesia, and insertion of intravascular catheters.

Before the surgical suite was opened for routine surgery, training sessions were held for consultants, CRNAs, and technicians to familiarize them with the new equipment. Mock surgical operations were conducted to ensure that all equipment was functioning properly, supplies were available, and appropriate procedures were in place for the optimal care of patients.

The opening of Mayo Clinic Hospital in October 1998 increased the number of locations requiring anesthesia services. These locations included 14 operating rooms; four procedure rooms to be used for insertion of invasive monitoring equipment, performing regional anesthetic blocks, or cardioversions; a separate procedure room for noninvasive surgery, invasive pain treatment procedures, and endoscopies; a magnetic resonance imaging (MRI) suite equipped with a MRI compatible anesthetic machine and monitoring equipment; and a radiology suite for endovascular procedures which is also suitably equipped to allow major vascular surgery.

Anesthesiologists with special skills were required to work with the new surgical disciplines added to the consulting staff with the opening of Mayo Clinic Hospital. The new disciplines included liver transplantation, kidney transplantation with laparoscopic nephrectomy for the living donors, minimally invasive cardiac surgery, and endovascular procedures.

In 2000, Mayo Clinic Scottsdale employs more than 250 physicians and scientists. More than 1,900 allied health personnel work at Mayo Clinic Scottsdale and 950 allied health care staff work at Mayo Clinic Hospital. By 1999, Mayo Clinic Scottsdale had cared for more than 446,000 patients. In 1999, the department of anesthesiology provided anesthetic care for more than 7,600 surgical patients.

## **2. Members of the Department of Anesthesiology in May 2000**

### **Anesthesiologists:**

Froukje M. K. Beynen, Renee C. Caswell, Peter E. Frasco, John B. Leslie, Leslie N. Milde (chair), Jeff T. Mueller, Jesse J. Muir, Karl A. Poterack, David P. Seamans, Terrence L. Trentman, and Kent P. Weinmeister

### **Internists:**

Swarma S. Chaliki, Susan G. Hagstrom

### **Administrator:**

Ms. Karen A. Biel

### **Nurse Anesthetists:**

Pauline C. Bisel, Jane Brady (facilitator), Ann M. Calderera-Bakker, Sharon M. Burns, Joseph C. Enright, Patricia M. Fowl, Janet L. Good, Mary A. Grayden, Catherine A. Guevara, Barbara A. Hadley (facilitator), Mary B. Laney, Celeste A. Melson, Bernadette P. Miller (supervisor), Kenneth H. Miller, Marlene A. Miller, Ellen M. Mitchell, Steven J. Morris, Sandra A. Myers, Mary C. Orzel, Robin W. Needham, Charles E. Oligmueller, Patricia J. Peabody, Faith Pembleton, Julie A. Schaible, Ellen J. Schoenbeck, Amy E. Shaw, Mark A. Tiede, Polly W. Wolff, Lisa A. Ziemann, and Leslie L. Zoltan.

### **Anesthesia Technicians:**

Michael L. Crowell (supervisor), Pamela J. Hildreth, Donald W. Jacobs, Roderick C. Prast, and Robert A. Simpson

### **Secretaries:**

Trudy S. Brown (supervisor), Joy K. Few, and Julie A. Schwartz

## **3. Education**

### **Residents in Anesthesiology**

In 1988, the Residency Review Committee for

Anesthesiology approved Mayo Clinic Scottsdale as an affiliated institution of the accredited residency program in anesthesiology at Mayo Clinic Rochester. An accredited institution has an agreement with its affiliated institution to provide their residents with necessary facilities, clinical experience, supervision, and teaching sessions. In the late 1980s, the first residents from Rochester started rotating to Scottsdale. These rotations in Scottsdale included various subspecialties and soon became popular. The variety of learning opportunities offered in anesthetic practice and techniques, the involvement of consultants in clinical teaching, and the weather contributed to the desirability of the rotation to Scottsdale. In 1992, the Residency Review Committee approved Mayo Clinic Scottsdale as an integrated institution, allowing residents to spend more time in their training in the department.

The number of residents in anesthesiology who completed part of their training has increased progressively. Currently, resident training is available in anesthesia for ambulatory surgery; cardiovascular and thoracic surgery; ear, nose, and throat surgery; neurologic surgery; pain management; regional anesthesia; and critical care medicine. Between 14 and 20 residents each year receive training in the department of anesthesiology at Mayo Clinic Scottsdale.

### **Fellowship in Pain Management**

Approximately six fellows each year rotate through the pain clinic at Mayo Clinic Scottsdale. They come from Mayo Clinic Rochester, from Mayo Clinic Jacksonville, and from the Maricopa County Medical Center in Arizona.

The Residency Review Committee for Anesthesiology approved a fellowship program in pain management, which becomes effective in 2000. Approval of this first fellowship program represents a major step in the educational efforts of the department. This program should lead the way to the approval of fellowships in other subspecialties of anesthesiology at Mayo Clinic Scottsdale.

### **Medical Students**

Beginning in 1989, five to eight medical students each year elected rotations in anesthesiology at Mayo Clinic Scottsdale. The students came mostly from the University of Arizona (Tucson) and from the Mayo Medical School in Rochester. Based on their favorable experience with the rotation, many of them entered a residency in anesthesiology. This development demonstrates that an early contact with medical students is an excellent recruiting tool and can stimulate their

interest in the specialty of anesthesiology. At the present time, the department of anesthesiology is negotiating with the University of Arizona to offer a core curriculum in anesthesiology to third-year medical students.

#### ***Residents in Other Specialties***

The department of anesthesiology provides rotations for three to four residents each year from the department of surgery for their required rotations. The department also accepts one to three residents each year, each from the departments of internal medicine and family medicine for an elective rotation.

#### ***Continuing Medical Education***

Under the leadership of Dr. McMichan, the department of anesthesiology has organized and hosted the meeting *Current Topics in Anesthesiology* for the last 10 years. This meeting has gained a national reputation and has grown from a 2-day to a 4-day course. The format is a combination of lectures and case discussions. Many lectures and all case discussions make use of interactive keyboards to permit audience participation. Speakers are mostly from the Mayo

Clinic's three campuses. In addition, nationally known keynote speakers from other institutions are invited to lecture. The program has been so favorably received that it must now be limited to 200 registrations per year.

#### **4. Research**

Because of the clinical workload, research efforts by members of the department of anesthesiology have been limited. Eighteen original scientific articles about clinical subjects have been written and 8 clinical studies are currently in progress. Recently, a clinical research unit was opened at Mayo Clinic Hospital. The co-director of this unit is Dr. Leslie, a member of the department of anesthesiology.

#### **5. Acknowledgements**

I would like to thank Drs. Muir and Weinmeister for their advice and insights.

*Leslie Newberg Milde*

# V. Education

## 1. Training in Anesthesia: The Early Years

The first physician instructor of anesthesia in the Mayo practice was Dr. William Worrall Mayo (1819-1911). He also deserves credit for having taught anesthesia to one of the youngest students. His youngest son, Charles Horace Mayo (1865-1939), was only 12 years old when he administered chloroform under his father's direction after the physician scheduled to provide this care had become ill.

Dr. Charlie maintained an interest in anesthesia throughout his early years. He and his brother, Dr. William James Mayo (1861-1939), often administered anesthesia while their father conducted surgical procedures. In turn, their father delivered the first anesthetic at St. Marys Hospital shortly after the hospital opened in 1889. It was for an operation to remove a malignant eye performed by Dr. Charlie, who was assisted by his brother Dr. Will.

Drs. Augustus W. Stinchfield (1842-1917) and W. W. Mayo were the first physicians at Mayo Clinic to instruct nurses in the art of administering anesthesia. Dr. Stinchfield taught Dinah F. Graham (1860-1947), and Dr. Mayo instructed Edith M. Graham (1871-1943). However, Dinah's career in anesthesia was brief and Edith gave up her work in the operating rooms after 4 years of practice when she married Dr. Charlie. Edith's friend, Alice Magaw (1860-1928), succeeded her as an anesthetist. Edith Graham was the first nurse to serve as an instructor in anesthesia at Mayo Clinic.

From 1889 and into the 1920s, anesthesia education consisted primarily of operating room apprenticeships supervised by physicians and experienced nurses. The training of nurses to administer anesthesia was driven by growth in the surgical practice. In 1893, 495 surgical procedures had been performed at Mayo Clinic. By 1920, this number had increased to 22,700 procedures.

## 2. Education of Physicians

### *Education of Residents*

In 1921, Dr. Louis Gaston Labat (1876-1934) trained Dr. William R. Meeker (1889-1955) in the practice of regional anesthesia for a 4-month

period at Mayo Clinic. After the appointment of Dr. John S. Lundy (1894-1973) in 1924, a more formal education program was introduced. In 1925, Dr. Charles F. McCuskey (1893-1980) was the first fellow to receive such training in anesthesia. Subsequently, he joined the faculty and had a distinguished career in his own right.

Near the end of the 1920s, Dr. Lundy organized a 3-year fellowship for training in anesthesia. The proposed fellowship included 18 months of training in research (with Mayo Clinic faculty), 3 months of training in anatomy, and 15 months of training in clinical anesthesia. Unfortunately, no one applied for this fellowship. The prevailing belief at that time was that this fellowship was excessively rigorous and too long in duration. When it was originally established in 1941, the American Board of Anesthesiology required only 2 years of training. The ABA did not increase the requirement to 3 years of clinical anesthesia training until 1985.

Physicians trained in anesthesiology at Mayo Clinic have significantly influenced the evolution of academic anesthesiology in the United States. For example, in 1926, Dr. Ralph M. Waters (1883-1979) joined the section of anesthesia as an assistant to work with Dr. Lundy for 3 months of regional anesthesia experience. Subsequently, Dr. Waters was appointed the first professor of anesthesia and chair of the department at the University of Wisconsin in Madison, where he proceeded to establish one of the most successful academic anesthesiology departments of its time. From that time forward, Mayo residents in anesthesiology have made contributions to medicine, sometimes starting during residency. For example, Dr. David J. Massa (1923- ) invented the modern plastic intravenous catheter and needle. More recently, Dr. Scott Augustine (1954- ) introduced the widely accepted practice of treating the patient's temperature with a warm air blanket device. The contributions of other men and women who completed residencies in anesthesiology at Mayo Clinic are documented elsewhere in this book.

Dr. Lundy and his colleagues also participated in the training of resident physicians in other disciplines such as internal medicine and surgery during the early years. Providing this training raised the visibility and credibility of the section

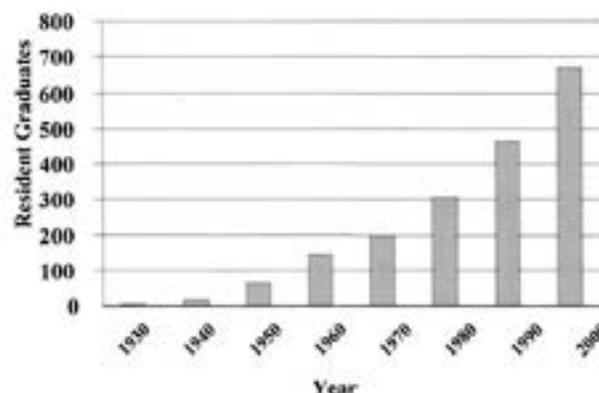
on anesthesia within the Mayo Clinic and increased the recognition of the specialty among physician colleagues. This, in turn, interested other residents to enter anesthesiology.

From 1925 through 1941, 24 residents completed their training in anesthesiology at Mayo Clinic. During World War II (1939-1945), 153 army medical officers received practical instructions in anesthesia at Mayo Clinic to prepare them for the needs of the war.

In general, the number of residents enrolled in anesthesiology has increased progressively (Fig. 1). However, in the mid-1990s, a perception developed nationally that the specialty of anesthesiology had limited employment opportunities. As a result, academic departments of anesthesiology received fewer resident applications from graduates of United States medical schools. Despite this, the department of anesthesiology at Mayo Clinic continued to fill all its residency program positions, primarily through the national resident match program each year.

The American Board of Anesthesiology requires the department chair to assume full responsibility for the residency program. After World War II, department chairs started appointing residency directors to provide leadership in

**Cumulative Graduates of Mayo Anesthesiology Residency**



**Fig. 1. Cumulative numbers of residents in the department of anesthesiology at Mayo Clinic.**

**Table 1.**  
Department/Section Chairpersons and Residency Directors of Mayo Anesthesiology Residency\*

Department/Section Chairs	Residency Directors
<b>Mayo Clinic Rochester</b>	
Dr. John S. Lundy (1924-1952) Dr. Charles R. Adams (1952-1953) Dr. Albert Faulconer, Jr. (1953-1971)	Dr. Robert T. Patrick Dr. John T. Martin Dr. Alan D. Sessler
Dr. Richard A. Theye (1971-1977)	Dr. Alan D. Sessler
Dr. Alan D. Sessler (1977-1988)	Dr. James A. Prentice Dr. Ronald J. Faust (1976-1989)
Dr. Roy F. Cucchiara (1988-1991)	Dr. Ronald J. Faust (1989-1991)
Dr. Duane K. Rorie (1991-1999)	Dr. Ronald J. Faust (1991) Dr. Leslie N. Milde (1991-1994) Dr. Steven H. Rose (1994-1999)
Dr. Mark A. Warner (1999-present)	Dr. Steven H. Rose (1999-present)
<b>Mayo Clinic Jacksonville</b>	
Dr. James V. Harper (1986-1996) Dr. Tim J. Lamer (1996-2000)	Dr. Timothy S. J. Shine (1986-1993) Dr. Gavin D. Divertie (1993-1997) Dr. Marie L. DeRuyter (1997-present)
<b>Mayo Clinic Scottsdale</b>	
Dr. John C. McMichan (1986-1992) Dr. Jeffrey J. Lunn (1992-1997) Dr. Leslie N. Milde (1997-present)	Dr. Karen C. Spaccarelli (1991-1994) Dr. Leslie N. Milde (1994-1997) Dr. Renee E. Caswell (1997-present)

\* Dates in parentheses represent years in this position.



Fig. 2. Resident group photo in 1977.

recruitment and selection of residents, design of didactic and clinical curricula, and day-to-day direction of resident activities (Table 1).

Each department chair influenced the residency program. The visionary Dr. Lundy conceived a 3-year plan for residency training in anesthesiology decades before it was formally initiated by the American Board of Anesthesiology. Dr. Albert Faulconer, Jr. (1911-1985), appointed Drs. Robert T. Patrick (1920-1999), John T. Martin (1924- ), and Alan D. Sessler (1932- ) consecutively as residency program directors. Their leadership strengthened the residency program, and a progressive growth in numbers and quality of residents resulted. Dr. Richard A. Theye (1923-1977), a forceful leader, continued to make education a department priority. He, along with Drs. John D. Michenfelder (1931- ) and Sessler, persuaded the clinical practice committee of Mayo Clinic to delay the start of surgery on Wednesdays from 7:45 a.m. to 8:15 a.m. This delay allowed a mid-week educational conference that continues to the present as the main forum for visiting faculty presentations.

Dr. James A. Prentice (1937- ) and Dr. Ronald J. Faust (1944- ) served as residency directors during Dr. Sessler's tenure as chair. Under their leadership, postgraduate medical education was emphasized and the number of residents and fellows increased progressively.

Drs. Sessler and Faust dedicated a major component of their careers to resident education, and both served as leaders of the department resi-

dency program for many years. Under their guidance, the residency program expanded from the enrollment of only 1 new resident per year in 1964 to as many as 17 per year in 1975. During Dr. Faust's service as residency director, 248 residents and fellows were trained and the program expanded from 26 to 62 positions (Figs. 2 and 3). Systems for more formalized subspecialty training, applicant recruitment and selection, faculty evaluation, and mock oral examinations also were imple-

mented.

When Dr. Roy F. Cuccchiara (1943- ) was appointed chair, he and Dr. Faust instituted a policy that allowed faculty to provide more personal instruction during the initial training of new residents. The subsequent chair, Dr. Duane K. Rorie (1936- ), working with his residency program directors, Drs. Leslie N. Milde (1943-) and Steven H. Rose (1955- ), greatly improved data collection of resident evaluations by the faculty to aid faculty development and initiated a distinguished educator program to recognize outstanding teachers (Table 2). Dr. Rorie also successfully defended the principle of an integrated residency program at Mayo Clinic when the Residency Review Committee for Anesthesiology of the Accreditation Council for Graduate Medical Education questioned the practicality of maintaining an integrated residency at Mayo's three practice sites. Dr. Mark A. Warner (1953- ), appointed chair of anesthesiology in 1999, already has made education a priority during his brief tenure as chair. He has established



Fig. 3. Resident group photo in 1990.

**Table 2.**  
Awards and Recognition \*

H. V. Jones Award for Outstanding Scientific Achievement  
 Dr. Kai Rehder (1962)  
 Mayo Medical School Teacher of the Year  
 Dr. Mark A. Warner (1988)  
 Mayo Brothers Distinguished Fellowship Award  
 Dr. Mark Keegan (1999)  
 Donald Church Balfour Award of Mayo Alumni Association for Outstanding Research by a Clinical Resident  
 Dr. David O. Warner (1988)  
 Dr. Michael J. Joyner (1991)  
 Kendall Award of Mayo Alumni Association for Outstanding Research by a Basic Research Fellow  
 Dr. Wolf H. Stapelfeldt (1988)

**Mayo Fellows Association Teacher of the Year in Anesthesiology**

Dr. Sheila Muldoon (1972)	Dr. Rungson Sittipong (1986)
Dr. Brian Dawson (1973)	Dr. Deborah Wilkowski (1987)
Dr. Rungson Sittipong (1974)	Dr. Joseph Messick (1988)
Dr. John Tinker (1975)	Dr. Leslie Milde (1989)
Dr. Gerald Gronert (1976)	Dr. Robert Chantigian (1990)
Dr. Rick Schwetzmann (1977)	Dr. David Brown (1991)
Dr. Ronald MacKenzie (1978)	Dr. Kevin Ronan (1992)
Dr. Lee Nauss (1979)	Dr. Kevin Ronan (1993)
Dr. James Poston (1980)	Dr. Gurinder Vasdev (1994)
Dr. Ronald MacKenzie (1981)	Dr. Lee Nauss (1995)
Dr. Froukje Beynen (1982)	Dr. Denise Wedel (1996)
Dr. Mark Martinson (1983)	Dr. Thomas Wass (1997)
Dr. Matthew Crawford (1984)	Dr. Robert Chantigian (1998)
Dr. Josef Wang (1985)	Dr. Thomas Wass (1999)

**Richard A. Theye Award** (awarded by division of anesthesia research for outstanding achievement in medical literature)

Dr. Brian Bertha (1989)	Dr. Niki Dietz (1994)
Dr. Michael Joyner (1990)	Dr. Thomas Wass (1995)
Dr. David Cook (1991)	Dr. Creston Martin (1996)
Dr. Thomas Christopherson (1992)	Dr. Steven Clendenen (1997)
Dr. Gilbert Wong (1993)	Dr. Scott Kuhnert (1998)
Dr. James Hebl (1999)	

**Annual Resident Banquet Awards**  
(Nominated by staff)

**Distinguished Educator Award**

Dr. Roger White (1994)  
 Dr. Gerard Kamath (1995)  
 Dr. Martin Abel (1996)  
 Dr. Gerard Kamath (1997)  
 Dr. Thomas Wass (1998)  
 Dr. Steven Rose (1999)

**Distinguished Educator Award**  
(Nominated by residents)

Dr. Marin deCastro (1993)  
 Dr. Gerard Kamath (1994)  
 Dr. Steven Rose (1995)  
 Dr. Norm Torres (1996)  
 Dr. Thomas Wass (1997)  
 Dr. Thomas Wass (1998)  
 Dr. Thomas Wass (1999)

**Distinguished Resident Award**

Dr. Patricia Martin (1993)  
 Dr. Terry Trentman (1994)  
 Dr. Stephen Foster (1995)  
 Dr. David Martin (1996)  
 Dr. Malcolm Sanders (1997)  
 Dr. Scott Cunningham (1998)  
 Dr. James Hebl (1999)

**Distinguished Resident**

Dr. Norman Torres (1993)  
 Dr. Norman Torres (1994)  
 Dr. Norman Torres (1995)  
 Dr. Brian McGlinch (1996)  
 Dr. Scott Cunningham (1997)  
 Dr. Carlos Mantilla (1998)  
 Dr. Brian Leonovicz (1999)

**Distinguished Clinician Award**

Dr. Steven Rose (1993)  
 Dr. David Danielson (1994)  
 Dr. Martin Abel (1995)  
 Dr. Gerard Kamath (1996)  
 Dr. Martin Abel (1997)  
 Dr. Martin Abel (1998)  
 Dr. Robert Chantigian (1999)

\* Dates in parentheses indicate year of award.

a visiting professor program in which participants are selected to specifically address the residents' educational needs.

Dr. Sessler's contribution in postgraduate medical education was recognized by his appointment as dean of Mayo Graduate School of Medicine. Dr. Faust's leadership in education has been demonstrated by his prominent role in the formation of the Society for Education in Anesthesia and his presidency of that society from 1991 to 1992. Dr. Faust, with Drs. Cucchiara, Milde, Rose, Thomas N. Spackman (1949- ), and Denise J. Wedel (1952- ), as associate editors, published the text *Anesthesiology Review* in 1991. This unique and popular text, now in its third edition, combines the peer-reviewed contributions of many residents in the department.

Dr. Milde succeeded Dr. Faust as residency director in 1991. She served in this position until 1994, when she joined the faculty of Mayo Clinic Scottsdale. During her tenure as residency program director, she implemented a program emphasizing personal interaction among faculty and applicants, which enhanced the ability of the department to recruit outstanding residents. Currently, she is chair of the department of anesthesia at Mayo Clinic Scottsdale, where she continues her support of resident and fellow education. Dr. Rose is the current director of the residency program. He succeeded Dr. Milde in 1994 and successfully recruited a full complement of highly qualified residents during the intensely competitive mid-1990s.

#### ***Education of Residents in Scottsdale and Jacksonville***

When Mayo Clinic established group practices of medicine in Jacksonville, Florida, and Scottsdale, Arizona, clinical care, education, and research were considered to be interdependent integral components.

Anesthesiology was the first department to offer resident education at the group practices. Drs. Timothy S. J. Shine (1953- ), together with Drs. Sessler and Faust, initiated a rotation at Mayo Clinic Jacksonville in 1988, and Dr. Mark H. Ereth (1958- ) was the first resident, in any specialty, to train at Mayo Clinic Jacksonville. Dr. Sessler, in his role as dean of Mayo Graduate School of Medicine, worked to establish a broad spectrum of educational activities at Mayo Clinic Jacksonville and Mayo Clinic Scottsdale. The first resident rotations at Mayo Clinic Scottsdale began in the late 1980s.

Residency training in Jacksonville and Scottsdale progressed from brief elective rotations to Residency Review Committee approval

as affiliated training sites. An accredited, integrated residency, which includes the 3 campuses, was eventually established. Faculty exchange, frequent rotation among sites, and advanced telecommunications have strengthened the integration of the Mayo Clinic residency.

The department of anesthesiology has maintained continuous accreditation of its residency program since it was granted. Faculty and trainees have received awards for educational contributions. Some of these awards are listed in Table 2.

#### ***Research Training in Residency***

From its inception, the anesthesiology department has encouraged residents to develop an interest in research. In the early years, prior to the establishment of the American Board of Anesthesiology, residents were encouraged to pursue a graduate degree as an added qualification to an academic career. Dr. Edward B. Tuohy (1908-1959) successfully defended his master of science thesis in 1935 and, according to Dr. Lundy, was the first to receive the master of science degree in anesthesiology.

Mayo anesthesiology residents have a long history of participation in the Midwest Anesthesia Residents' Conference. This conference has proved to be an effective forum for residents to gain experience in academic presentation, and most residents present at this conference during their training (Fig. 4). Many Mayo residents have received awards at this conference before starting their academic careers.

Several Mayo Clinic residents and fellows have received awards from the Foundation for



**Fig. 4. Anesthesiology residents from Mayo Clinic Rochester who participated in the Mid-west Anesthesia Resident Conference in Milwaukee in 1984.**

Anesthesia Education and Research to support scientific inquiry. Award winners include Drs. Roger E. Hofer (1957- ), Philippe Housmans (1953- ), Joseph M. Hughes (1957- ), William L. Lanier (1955- ), Jeffrey J. Lunn (1952- ), Rorie, Keith L. Stein (1957- ), David O. Warner (1957- ), Gilbert Y. Wong (1963- ), Dwight C. Legler (1951-1986), Sheila M. Muldoon (1935- ), Brian Donahue (1963- ), William J. Perkins (1954- ), Alan A. Artru (1949- ), and others.

Mayo anesthesiology residents also have received the prestigious H. V. Jones, Donald Church Balfour and Kendall awards for excellence in research completed during training (Table 2). These highly competitive awards are available to residents or fellows in Mayo Graduate School of Medicine. In 1988, both the Balfour and Kendall awards were presented to anesthesiology residents. Dr. David O. Warner received the Donald Church Balfour award and Dr. Wolf H. Stapelfeldt (1958- ), received the Kendall award.

Since the inception of the program, many graduates have become established investigators and a number of them have succeeded in obtaining National Institution of Health (N. I. H.) funding. The training of residents and fellows in anesthesiology research is discussed and documented in the chapter VI. Research.

### **Education of Fellows**

Fellowships are conducted in a broad spectrum of subspecialty areas in the Mayo Clinic departments of anesthesiology. Graduates of the departments' fellowship training programs frequently have joined the Mayo Clinic anesthesiology faculty and achieved successful academic careers. Other graduates have used their additional training in successful careers in academic anesthesiology at other academic centers or in private practice.

Fellowship training in cardiovascular and thoracic anesthesia at Mayo Clinic Rochester has prepared trainees for advanced scientific and clinical work in this discipline for many years. Recently, advanced training in echocardiography has become an important component of this fellowship. Mayo Clinic Jacksonville was approved to provide fellowship training in cardiothoracic anesthesia/TEE in 2000.

Fellowship training in pain management has progressed from initial training of a single fellow on the Rochester campus to the achievement of fully accredited pain management fellowships in Rochester, Jacksonville, and Scottsdale. Fellows are trained in advanced clinical pain management principles and techniques and many participate in research. The number of fellows

training in pain management should continue to increase.

Fellowship training in critical care medicine has also grown dramatically over the years. At present, accredited critical care fellowship training programs are conducted in Rochester and Jacksonville. Several graduates of these programs have joined the Mayo Clinic anesthesiology faculty and are disproportionately represented annually in the department's selection of distinguished clinicians.

Fellowship training in obstetrical anesthesia has provided advanced training to several fellows interested in the clinical and scientific aspects of this subspecialty. An obstetric anesthesia fellowship at Mayo Clinic Jacksonville was established in 2000.

Fellowship training in neuroanesthesia has been a long established and sought after program at Mayo Clinic Rochester. Academic neuroanesthesiologists working here have included Drs. Faust, Lanier, Milde, Gerald A. Gronert (1933- ), Joseph M. Messick (1935- ), and John D. Michenfelder (1931- ). They have all participated in training fellows who subsequently pursued academic careers in this field.

Fellowship training in pediatric anesthesiology was limited in the Mayo Clinic department of anesthesiology until recent years. In 1993, a fellowship in pediatric anesthesiology was developed through affiliation with the Nemours Foundation and Wolfson Children's Hospital in Jacksonville. This fellowship program became provisionally accredited when accreditation became available in 1999.

The department of anesthesiology at Mayo Clinic Rochester also offers fellowship training in regional anesthesia. Dr. Denise J. Wedel (1952- ), past president of the American Society of Regional Anesthesia, is a graduate of the Mayo Clinic anesthesiology residency who completed a fellowship in regional anesthesia at Virginia Mason Clinic in Seattle, Washington, as a Mayo Foundation scholar. She and several colleagues revitalized interest in regional anesthesia at Mayo Clinic.

Fellowship training in transplant anesthesia became available at Mayo Clinic with the advent of kidney, liver, cardiac, thoracic, and other transplantation programs. This fellowship typically includes advanced clinical training combined with scientific investigation.

### **Diversity**

Over the years, the faculty, residents and fellows of the Mayo Clinic department of anesthesiology have become increasingly diverse. The spouses of Drs. Sessler, Paul F. Leonard (1926-

1998) and Norbert Schnelle (1922- ) were all respected academically trained anesthesiologists, but they could not work at the Mayo Clinic which did not support appointing spouses as consultants at that time. For this reason, Drs. Martha Sessler (1933- ), Vivita Leonard (1932- ), and Hannaliese Kralemann (1926- ) were required to work off campus. By 2000, three physician husband and wife teams are members of the department faculty, and four of the eight clinical divisions in the department are chaired by women.

Similarly, the department goal of encouraging the training of minorities has fortunately met with success, and currently, minority graduates of Mayo Clinic residency and fellowship programs are valued and productive members of the faculty.

### ***Mayo Graduate School of Medicine***

Mayo Graduate School of Medicine was founded in 1915 and currently has more than 1,000 residents enrolled in more than 150 training programs. The department of anesthesiology has participated significantly in the governance of the school. Dr. Sessler served as dean of Mayo Graduate School of Medicine from 1989 through 1994. During his tenure as dean, he helped to develop graduate medical education at Mayo Clinic Jacksonville and Mayo Clinic Scottsdale.

### ***American Board of Anesthesiology***

Academic recognition did not come easily to the new specialty of anesthesiology. Affiliation of the American Board of Anesthesiology with the American Board of Surgery was completed on June 2, 1937. The meeting at which the American Board of Anesthesiology was incorporated was held on March 13, 1938. On February 26, 1941, the American Board of Medical Specialties and American Medical Association Council on Medical Education finally approved the American Board of Anesthesiology as an independent primary board.

Dr. Lundy was one of the nine founding directors of the American Board of Anesthesiology. The American Society of Anesthesiology, American Society of Regional Anesthesia, and the American Medical Association each nominated three of the founding directors. Dr. T. Drysdale Buchanan (1876-1940) became the first president. Dr. Waters served as president from 1940 to 1942 and was succeeded by Dr. Lundy. Ten Mayo Clinic anesthesiologists have served as directors of the ABA (See VII. Appendix).

Dr. Lundy had an influential role in the activities of the American Board of Anesthesiology. In a letter describing the early history of the board,

Dr. John Adriani (1907-1988) described the internal rivalries in the American Board of Anesthesiology as follows:

There were two main cliques- the Waters-Rovenstine clique...and the Mayo Clinic. The Mayo Clinic school embodied people like Lundy, Tovell and McCuskey. The Waters group embodied Waters and Rovenstine principally. Lundy had a bigger following and therefore he took in fellows such as Henry Ruth and Woodbridge and a number of others. As a result the ABA was highly political for almost 20 years. Lundy dominated the Board for many years. As a matter of fact, he served for 18 years.

Examinations for certification by the American Board of Anesthesiology consisted of essay questions in anatomy, pathology, physics, chemistry, physiology, and pharmacology; observation of candidates during clinical work; and oral examinations in which only a few or a single question was asked.

Dr. Adriani went on to describe the oral examination:

We all stood in awe of Waters and Lundy. It wasn't long before various members of the Board acquired "reputations" as examiners. Lundy was considered a "tough" examiner. When I took my oral ...they told me they were waiting for Dr. Lundy to come in; he was the third examiner. They had only three examiners and only one session at that time. Four or five minutes later Dr. Lundy came in and said... "I apologize. I am sorry I can't be with you because I have to attend a meeting with the AMA officials to see about getting our Section on Anesthesia organized." When I heard that Lundy was supposed to examine me before he came in, I practically froze in my seat. I tried to conceal my delight when I heard that he was not going to examine; it certainly was a relief. My examination consisted of one question. How to treat spinal headache. I said give the patient some codeine and aspirin; that is about all we knew at that time.

The founders and first directors of the board were all influential leaders in their specialty at the time. Later, Dr. Adriani described the selection process:

In the late 40's and early 50's replacements occurred. There was considerable dissatisfaction with the manner of selecting the new Directors. The general feeling was that Lundy was packing the Board with Mayo people. For example, McCuskey who was Lundy's righthand (sic) man was added and later Tuohy.

### **3. Undergraduate Medical Education in Anesthesiology**

For many years, Mayo Clinic participated in postgraduate medical education through its Graduate School of Medicine but had no undergraduate medical school. Considerable controversy about the wisdom of initiating undergraduate medical education existed among Mayo Clinic

staff, but the decision was made to proceed, and Mayo Medical School was opened in 1972.

The anesthesiology faculty has participated in medical school education since the school was established. During the first 2 years, didactic instruction in physiology, pharmacology, anatomy, and other scientific disciplines was provided by Drs. Kai Rehder (1928- ), Russell A. Van Dyke (1930- ), Michael J. Murray (1949- ), Rorie, Wedel, Joyner, Lanier, Faust, Cucchiara, Housmans, and Messick. Dr. Rorie, who holds a doctorate in anatomy in addition to his M.D. degree, was the first professor of anatomy at the medical school from 1972 through 1985. His teaching, as well as that of other anesthesia department members, was in part responsible for inspiring several Mayo Medical School students in their choice of anesthesiology as a career.

A mandatory second-year didactic course in anesthesiology was initiated at Mayo Medical School in the 1980s. The first director of this course was Dr. Cucchiara. He was succeeded by Drs. Rose, Susan Black (1957- ), Brian A. Hall (1956- ), and Brian P. McGlinch (1962- ). More than 45 other anesthesiology faculty members have participated in this course.

The third-year clinical clerkship in anesthesiology has been directed by Drs. Cucchiara, Rorie, Mark A. Warner, Rose, and McGlinch, and is currently under the direction of Dr. Christopher M. Burkle (1963- ). Dr. Mark Warner was recognized as *Teacher of the Year* in 1988 for his outstanding contribution to medical school education through his work with students during this rotation. Many Mayo Medical School graduates have enrolled in the Mayo anesthesiology residency program, and eight graduates have been appointed to the anesthesiology faculty.

Drs. Nicki D. Rippeteau (1949- ), Mark Warner, Messick, Brian Hall, Prentice, Joyner,

Peter A. Southorn (1941- ), Wedel, Rose, Terese T. Horlocker (1959- ), and Keith H. Berge (1958- ) have served as medical student advisors, and Drs. Cucchiara, Rose, Southorn, David R. Danielson (1952- ), and Gary S. Sieck (1948- ) have served on the Mayo Medical School admissions committee. Finally, Drs. Mark Warner, David Warner (1957- ), Sieck, Joyner, Niki M. Dietz (1961- ), Robert L. Lennon (1940- ), Rehder, Faust, and many others have served as research mentors to undergraduate and medical students.

Medical students have elected rotations in anesthesiology at Mayo Clinic Jacksonville and Mayo Clinic Scottsdale since 1989. Five to eight students enroll in the Scottsdale rotation each year. Most are students from the University of Arizona (Tucson) or Mayo Medical School in Rochester. Students in Mayo Medical School and other medical students rotate in Jacksonville as well. Based on their positive experience, some of these students have selected residencies in anesthesiology. Currently, the University of Arizona and the department of anesthesiology at Mayo Clinic Scottsdale are discussing a core curriculum for third-year medical students.

#### 4. Anesthesia Training at Mayo School of Health-Related Sciences

Nurse anesthesia and respiratory therapy training programs are conducted by the department of anesthesiology under the direction of Mayo School of Health-Related Sciences. In 1999, Dr. Murray was appointed dean of Mayo School of Health-Related Sciences.

##### *Training of Nurse Anesthetists (Table 3)*

Until the 1940s, nurse anesthesia education at Mayo Clinic consisted of practical "on the job" training. Experienced nurses and doctors provided instruction in operating rooms, and students

**Table 3.** Medical and Program Directors of Nurse Anesthesia \*

Medical Directors	Program Directors
Dr. John Lundy	Mr. R. Johnson, CRNA, MS (1957-1988)
Dr. Charles Adams	Mr. E. Thompson, CRNA, MS (1988-1997)
Dr. Thomas Seldon	Ms. M. Marineau, CRNA, MS (1997-present)
Dr. John Osborn	
Dr. Roger Ridley	
Dr. John Paulson	
Dr. Virginia Hartridge (1965-1974)	
Dr. Donald Krabill (1974-1984)	
Dr. Lawrence Perry (1984-1987)	
Dr. Robert Lennon (1987-1991)	
Dr. Beth Elliott (1991-present)	

\* Dates in parentheses represent years in position.

were given more responsibility over time as their experience increased. Similarly, the appointment process was informal, and there was no established didactic curriculum.

Dr. Lundy was the first director of the nurse anesthesia program. Drs. R. Charles Adams (1906-1956), Thomas H. Seldon (1905-1991), John E. Osborn (1919-1957), Roger W. Ridley (1918- ), and John A. Paulson (1908-1994) succeeded Dr. Lundy as medical directors of the nurse anesthesia program.

By the mid-1940s, the program began to function in a more organized fashion. Staff anesthesiologists participated in classroom instruction, and nurse anesthesia students and graduate nurse anesthetists were encouraged to attend weekly seminars presented by residents. However, the didactic courses remained mostly clinical in orientation. During this decade, the length of the nurse anesthesia program varied between 24 and 36 months, depending on the progress of each student.

In 1956, Dr. Virginia B. Hartridge (1919- ) was appointed to be in charge of the education of nurse anesthetist students and in 1965, she succeeded Dr. Paulson as director of the nurse anesthesia program. Dr. Hartridge organized the first formal and comprehensive curriculum for training nurse anesthetists. She scheduled weekly lectures and seminars at times when all students could attend, thus providing a more complete educational experience to the students. In 1957, Mr. Robert Johnson (1932- ), CRNA, was assigned to assist Dr. Hartridge in providing nurse anesthesia education.

To better control admission and termination procedures, develop program policies, and oversee school activities, Dr. Hartridge and Mr. Johnson formed the nurse anesthesia education committee in 1964. Committee membership included two staff anesthesiologists (one from St. Marys Hospital and one from Rochester Methodist Hospital), the Mayo Clinic personnel director, and the administrative assistant to the department.

In 1970, Mr. Johnson was appointed the first program director of the nurse anesthesia program. When he retired from Mayo Clinic in 1988, Edward Thompson, CRNA, MS (1948- ) became the second director. He was succeeded by Mary E. Shirk Marienau (1950- ), CRNA, MS in 1997.

In 1974, Dr. Hartridge was succeeded as medical director of the nurse anesthesia program by Dr. Donald R. Krabill (1931- ), who in 1984 was succeeded by Dr. Lawrence B. Perry (1927- ). Dr. Lennon followed Dr. Perry as medical director in 1987. In 1989, Dr. Lennon and Mr. Thompson

developed plans for transition of the training program from a certificate-granting course to a graduate level course of study. The plan to offer masters degrees in nurse anesthesia was approved by the institution and all appropriate state governing bodies in only 1 year.

Dr. Beth A. Elliott (1956- ) became medical director of the nurse anesthesia program in 1991. She guided the final transition to a program granting a master of nurse anesthesia degree. Donald Vehrenkamp (1952- ), CRNA, was the first to complete the requirements for the master of nurse anesthesia degree at Mayo Clinic in 1992. By 1995, all nurse anesthesia students were required to complete a 30-month course of study and meet all qualifications for the masters degree.

#### **Education in Inhalational Therapy and Respiratory Care (Table 4)**

Dr. Edward P. Didier (1925- ) and Dr. Frederic H. Helmholtz, Jr., (1911- ) led the efforts to found an inhalational therapy school (later, respiratory therapy school) at Mayo Clinic Rochester. After an advisory committee had determined the financial, academic, and clinical resources required and had assessed the demand for these services, Drs. Didier and Helmholtz initiated discussions with representatives of Rochester Junior College in 1971. They proposed establishing an associate degree program for the training of inhalational / respiratory therapists. Members of the advisory committee included Dr. Didier, Dr. Sessler, Bernard P. Gilles (1930- ), CRNA, Dr. Helmholtz, Dr. Kenneth O. Makinen, (1930- ), and Dr. Gerald H. Needham (1917- ). The State of Minnesota provided initial funding through an educational grant.

In 1972, Dr. Didier was appointed medical director of the inhalational therapy school, Dr.

**Table 4. Medical, Program, Education and Clinical Directors of Respiratory Therapy \***

<b>Medical Directors</b> Dr. E. Paul Didier (1972-1987) Dr. David J. Plevak (1987-present)	<b>Program Directors</b> Dr. Kenneth O. Makinen, (1972-1976)
<b>Education Coordinator</b> Mr. Bernard Gilles CRNA, RRT (1972-1976) Mr. Jeffrey J. Ward, MED., RRT (1976-present)	<b>Clinical Coordinators</b> Ms Shirley J. Johnson, RRT (1978-2000) Mr. James E. Pringnitz, RRT (2000-present)

\*Dates in parentheses represent years in position.

Makinen was appointed program director, and Mr. Gilles was appointed education coordinator. The program was administered through the School of Health-Related Sciences and integrated into the department of anesthesiology within the section of respiratory intensive care. The Rochester State Hospital was included as an off-campus site for clinical training in airway management under the direction of Dr. Kralemann. This activity was transferred to St. Marys and Methodist hospitals when the Rochester State Hospital closed in 1981.

In 1972, seven students entered the first class. Classroom instruction was held in the old "cobalt suites" on the ground floor of St. Marys Hospital. The first class graduated after 2 years of training in 1974. In 1975, the inhalational therapy school received initial accreditation from the American Medical Association Council on Medical Education and Joint Review Committee for Respiratory Therapy Education. Classroom and laboratory facilities areas were relocated to G-63 at St. Marys Hospital in 1977. The new area provided more space and better accommodations for the growing needs of the school. In 1989, the program was again relocated to the newly built Siebens building. The new facilities included a laboratory that had gas lines and an intensive care unit equipped with state-of-the-art monitors.

In 1976, Mr. Jeffrey J Ward (1948- ), MEd, RRT, was recruited to serve as educational coordinator for the school. He was joined by Shirley J. Johnson (1938- ), RRT, as clinical coordinator of the program in 1978. Her appointment was in response to recommendations of the Joint Review Committee for Respiratory Therapy Education, which had suggested the school needed at least two full-time faculty members. Ms. Johnson resigned in 2000 after 22 years of valued service. She was succeeded by James E. Pringnitz (1971- ).

Dr. David J. Plevak (1953- ), associate medical director since 1986, succeeded Dr. Didier as medical director of the school in 1987. Dr. Didier's many outstanding contributions to the respiratory care school were recognized by the creation of the E. P. Didier Distinguished Lecture. Dr. Irwin Ziment had the honor of presenting the first E. P. Didier Distinguished Lecture, jointly sponsored by the department of anesthesiology and the respiratory therapy school.

The respiratory therapy program broadened its scope of training in 1988 to include training in cardiovascular stress testing, pulmonary function testing, and included rotations of students to the sleep disorders clinic. In 1992, the nicotine

dependency clinic was added as another clinical rotation. In 1999, the program was changed to a semester format and renamed the program in respiratory care. A proposal was submitted to the dean of Mayo School of Health-Related Sciences to establish a baccalaureate degree-granting program in partnership with the General College of the University of Minnesota.

The Program celebrated its 25th year with a dinner at the Plummer House as part of the annual E. P. Didier Distinguished Lecture series. Miriam Pogulis, a sophomore student, was recognized as the recipient of the national American Respiratory Care Foundation award for her scientific paper.

To date, more than 350 respiratory therapists have completed training in the Mayo Clinic program.

## **5. Cardiopulmonary Resuscitation and Cardiac Life Support**

No discussion of the department of anesthesiology's education efforts is complete without recognizing the contributions of Myron Ricks (1923-1996), CRNA, and Dr. Roger D. White (1939- ). For many years, Mr. Ricks instructed nurses, medical students, residents, staff, and others in basic life support. Dr. White provided similar sustained leadership in cardiac life support and emergency cardiac care. He is a member of the American Heart Association national and state faculties, directs Mayo Clinic's ambulance services, and is a recognized international authority on emergency cardiac care. From 1993 to the present, he has annually provided advanced cardiac life support training to Mayo Clinic faculty through a weekend course. He also is always available for "curbside" consultations in the operating rooms, particularly helping faculty and residents with the identification and treatment of complex arrhythmias.

## **6. Secretarial and Administrative Support**

The Educational programs of the department of anesthesiology have been supported by a succession of highly competent education secretaries and dedicated department administrators.

*Steven H., Rose Peter A. Southorn  
Alan D. Sessler*

# VI. Research

## Development of the Division of Anesthesia Research

### 1. Research by Dr. Lundy and Colleagues

When Dr. John S. Lundy (1894-1973) walked with Dr. William J. Mayo (1861-1939) to the railroad station in Seattle, Washington, after their first meeting at the banquet of the King County Medical Society, he told Dr. Mayo that more research related to anesthesia should be done, but that he could not personally be involved in this, given his position in Seattle. Dr. Mayo proceeded to offer him an opportunity to come to the Mayo Clinic. The excellent facilities available for clinical practice and research at the Clinic were the reasons for Dr. Lundy immediately accepting this invitation.

Upon his arrival at the Mayo Clinic on March 27, 1924, Dr. Lundy was initially preoccupied with establishing good clinical anesthesia, including regional anesthesia. He did not have the time for research. Subsequently, Dr. Lundy was to follow the routine of most clinicians at the Mayo Clinic when they wished to research a subject. This routine involved first discussing their potential study with a researcher working in the Institute of Experimental Medicine, which had been directed by Dr. Frank C. Mann (1887-1962) since 1914. The researcher would then decide whether the question could be solved experimentally and whether he was sufficiently motivated, equipped, and qualified to successfully perform the study.

In April 1929, 5 years after Dr. Lundy's arrival at the Mayo Clinic, he established a 3-year training fellowship in anesthesia which involved an extensive exposure to research. The fellowship comprised 6 months of research with Dr. Walter M. Boothby (1880-1953) on metabolic and respiratory studies, 6 months of research with Drs. Edward C. Kendall (1886-1972) and Arnold E. Osterberg (1894-1978) in physiologic chemistry, 6 months with Dr. Mann in experimental physiology, 3 months in anatomy, and the remaining 15 months spent in regional and general anesthesia. Unfortunately, this fellowship program could not be implemented because no candidate applied for it. The specialty of anesthesia was clearly not ready for such a sophisticated training program.

Dr. Lundy was clearly ahead of his time in other respects regarding research. He already

had raised extramural financial support for research in his section. In 1930, he received a grant for \$ 2,500 from The Chemical Foundation in New York. The money was to support experimental research. But Dr. Lundy spent the money: ...toward defraying part of the expense in a new type of work, which was partly clinical, partly comprehensive survey of the literature and partly laboratory experiments...

Not unexpectedly, The Chemical Foundation did not approve of this arrangement and informed Dr. Lundy:

...We regret to advise you that we will be unable to continue our contribution toward this work for the present...

Dr. Lundy was not discouraged and continued to raise extramural money for research. By 1934, he had collected \$ 4,259.95, which he used to establish the Mayo Clinic Anesthesia Fund. Initially, he personally controlled this fund, but after one year he was asked to transfer this control to Mr. G. Slade Schuster (1907-1999), the chief administrator of the Mayo Clinic.

### 2. The Era of Master of Science Theses

The Institute of Experimental Medicine was also utilized to expose anesthesia residents to research. Fellows in anesthesia were expected to spend at least 6 months in a research laboratory and prepare a master of science thesis. The scientists at the Institute of Experimental Medicine served, together with Dr. Lundy, as advisors for these projects. The advisors included: Drs. Frank C. Mann, Hiram E. Essex (1893-1978), and Jesse L. Bollman (1896-1979). Later, Drs. Charles F. Code (1910-1997), Walter M. Boothby, Earl H. Wood (1912- ), and Reginald G. Bickford (1913-1998) from the department of physiology also served as advisors.

Dr. Ralph M. Tovell (1901-1967) was the first fellow of the section on anesthesia to submit work on a master of science thesis. The subject of his thesis was *Anesthesia for Gynecologic and Obstetric Procedures*. However, Dr. Edward B. Tuohy (1908-1959), according to Dr. Lundy's accounts, became the first fellow to successfully defend his thesis. Drs. Charles J. Betlach (1909- ), Paul W. Searles (1908-1995), and Lloyd H. Mousel (1903-1970) were the second, third,



Fig. 1. Dr. Albert Faulconer, Jr., with his wife Mary Jean.

and fourth fellows to successfully defend their theses.

The master of science theses submitted by fellows dealt mostly with clinical problems in anesthesia. A list of authors, the titles, and the advisors of their theses is presented in Table 1.

A master of science thesis entitled *A Study for the Determination of Gas and Ether Vapor Tensions and the Use of These Methods During Semi-open Ether Anesthesia* was submitted in 1947 by Dr. Albert Faulconer, Jr., (1911-1985) (Fig.1). He had developed a novel instrument, an acoustic gas analyzer, to make accurate measurements of the concentrations of anesthetic and other gases. The principle of operation of this instrument was based on differences in the velocity of sound in gases of different compositions or concentrations. Using this instrument, Dr. Faulconer discovered that ether vapor diluted the oxygen concentration in the gas mixture under the anesthetic mask and that this diluting effect could potentially result in arterial hypoxemia of patients. Dr. Lundy was so impressed by the quality and originality of the work of Dr. Faulconer that he persuaded his friend Mr. Eli Lilly (1885-1977) of the Eli Lilly Company to donate \$ 6,000 in support of Dr. Faulconer's research work.

In 1948, Dr. Roger W. Ridley (1918- ) finished his thesis entitled *Concentrations of Oxygen,*

*Nitrous Oxide and Ether and their Correlation with Certain Physiologic Variables During Surgical Anesthesia in Man.* Using Dr. Faulconer's acoustic gas analyzer, Dr. Ridley found that the most crucial period of anesthesia in regard to the patient's oxygenation was the induction period. During induction of anesthesia in this era, patients were often given high concentrations of nitrous oxide and ether and thus would inhale low concentrations of oxygen. He also discovered that the inspired oxygen concentration during induction of anesthesia was further reduced by nitrogen eliminated from blood and body tissue, which was occurring simultaneously. A similar phenomenon of a reduced alveolar oxygen concentration caused by nitrous oxide leaving the body during emergence from anesthesia employing nitrous oxide was later described by Dr. Raymond Fink and given the name diffusion anoxia. Unfortunately, Dr. Ridley and his colleagues did not publish their observations in a peer-reviewed journal.

After the end of World War II (1939-1945), radioactive isotopes became available for civilian research projects. Dr. Lowell M. Brooks (1918- ) used this technique for his research thesis on *Studies on the Distribution and Fate of Pentothal Sodium Following Single Injection.* Rats were killed at predetermined intervals after injection of radioactive labeled sodium pentothal; samples of tissues and blood were obtained, and their radioactivity was determined. Dr. Brooks found that sodium pentothal was deposited in subcutaneous fat soon after injection. Later on, it came to be appreciated that this high concentration of sodium pentothal in fat tissue results from a redistribution of sodium pentothal from other tissues including the brain. This finding is the basis for the short hypnotic action of sodium pentothal.

Dr. Raymond F. Courtin (1912- ) submitted a thesis entitled *Electroencephalography During Surgical Anesthesia with Nitrous Oxide, Oxygen and Ether.* He demonstrated a significant correlation between changes in the electroencephalographic pattern and the depth of clinical anesthesia. He found that, with increasing depths of anesthesia, seven distinct changes occurred in the electroencephalogram waveforms.

Dr. Courtin's observations were utilized in the thesis prepared by Dr. Donald E. Soltero (1920- ). It was entitled *A Clinical Evaluation of Automatic Anesthesia.* Dr. Soltero converted the changes in the electric energy from brain waves of the electroencephalogram associated with changes in the depth of anesthesia into mechanical energy. Changes in the mechanical energy caused by the depth of anesthesia were used to



Fig. 2. Automatic anesthesia machine used to control the depth of anesthesia (master of science thesis of Donald E. Soltero).

regulate the rate of supply of intravenous or volatile anesthetics (Fig. 2). The depth of anesthesia could be kept constant with this instrument.

Dr. John S. Hattox (1921- ) wrote the thesis *A New Method for the Analysis of Blood Nitrous Oxide and its Application in a Study of Anesthesia with this Agent*. Up to this time, accurate measurement of anesthetic gas concentrations in body fluids was impossible with conventional techniques. Dr. Faulconer had modified a commercially available mass spectrometer to solve this problem, and in his thesis, Dr. Hattox used this modified mass spectrometer to measure nitrous oxide concentrations in blood.

Dr. Faulconer's numerous important contributions included the development of the acoustic gas analyzer and adaptation of a commercially available mass spectrometer to measure the concentration of anesthetic gases in body fluids. He correlated the depth of anesthesia with the concentration of the anesthetic agent in arterial blood. He also made another significant contribution in developing a computerized model to predict the concentration of an anesthetic agent in the tissues of the human body. When the solubility of the anesthetic in the various body tissues, the rate of blood flow to the tissues, and the rate of pulmonary uptake of the anesthetic agent are

known, Dr. Faulconer's model predicted accurately the rate of wash-in and wash-out of various anesthetics. Dr. Faulconer was proud of this model, and he presented it at an American Medical Association (AMA) meeting in the 1950s. He once mused that he had expected a large crowd of visitors, but only one person came to his booth!

Clinicians and researchers worked well and productively together at the Institute of Experimental Medicine of the Mayo Clinic for many years. An example of this is the discovery of cortisone by Drs. Edward C. Kendall working with Dr. Philip S. Hench (1896-1965). Eventually, there came a time when research in the laboratories could no longer be fully funded solely by income from clinical care provided by the Mayo Clinic. This problem resulted in researchers being expected to raise extramural funding for their research projects. This financial support came mostly from the National Institutes of Health (N.I.H.). Funding of a research project by N.I.H. made it more difficult for researchers to work on additional projects with uncertain outcomes and not directly related to their funded protocols.

### 3. Early Laboratory-Based Research Programs

The Mayo Clinic responded to the difficulty created by accepting N.I.H. money by establishing research groups within clinical departments. The gastrointestinal research unit at St. Marys Hospital, under the leadership of Dr. William Summerskill (1926-1977), a hepatologist of international reputation, was one of the first to be funded in this manner. Other early groups obtaining N.I.H. funding were those performing pulmonary and endocrinology research.

The section of anesthesia research was established in 1966, during the chairmanship of Dr. Faulconer. Dr. Richard A. Theye (1923-1977) was the first head of the section of anesthesia research and the first member of the department to obtain N.I.H. financial support. Other members of the research section initially were Dr. Emerson A. Moffitt (1924- ), Dr. John D. Michenfelder (1931- ), Dr. Kai Rehder (1928- ), and Dr. Gerald A. Gronert (1933- ).

Dr. Theye remained head of the section until 1973, when Dr. Rehder succeeded him. During the chairmanship of Dr. Alan D. Sessler (1932- ), the section of anesthesia research became a division of anesthesia research and Dr. Rehder was appointed chairman. He held this position for 14 years until 1987 when Dr. Michenfelder succeeded him and served until 1990.

**Table 1.**  
Master of Science Theses Prepared by Anesthesiologists Trained at the Mayo Clinic

Year *	Author	Title	Advisor(s) or comments
1932	Ralph M. Towell	Anesthesia for Gynecologic and Obstetric Procedures	
1934	John G. Dunlop	The Fate of Procaine in the Dog	
1935	Edward B. Tuohy	A Comparative Study of the Physiological Activity of Bobefrin and Epinephrine	First MS thesis defended by an anesthesiologist; Mann, Essex, and Lundy
1936	Charles J. Betlach	The Effects of Various Anesthetics and Certain Drugs on the Electrocardiogram of the Dog	Second MS thesis defended by an anesthesiologist
1936	Paul W. Searles	A Comparative Study of the Effect of Ether Anesthesia and Sodium Amytal Anesthesia on the Concentration of the Blood and the Rectal Temperature and the Effect of Ether Anesthesia on the Coagulation Time of the Blood Plasma	Third MS thesis defended by an anesthesiologist; Mann, Lundy, and Beck
1939	Lloyd H. Mousel	An Experimental Study of Respiratory Stimulants with Particular Reference to Anesthesia	Fourth MS thesis defended by an anesthesiologist
1940	Thomas H. Seldon	The Effect of General Anesthetic Agents on Small Blood Vessels	Mann, Lundy
1940	R. Charles Adams	Intravenous Anesthesia. Chemical, Pharmacologic and Clinical Consideration of the Anesthetic Agents Including the Barbiturates	
1940	E. Joseph Delmonico	Observations on the Behavior of Certain Barbiturates	Lundy, Essex
1940	Frederic A. Smith	The Effect of Sodium Amytal, Procaine, Chloral Hydrate, A. C. E. Mixture (Alcohol-Chloroform-Ether Mixture) and Chloroform on a peripheral Vascular System	Essex, Lundy
1941	Richard H. Barrett	The Effect of Certain Drugs on a Peripheral Vascular System	
1942	Bruce M. Anderson	The Identification of Certain Barbiturates and Observations on the Cyclic Disappearance from and Reappearance in the Blood following Injection	
1942	John W. Pender	A Comparative Study of Traumatic Shock Under Ether Anesthesia Produced by Certain Barbiturates	Essex, Lundy
1942	Charles D. Anderson	Effects of Certain Premedications on Traumatic Shock Produced in Animals Under Ether Anesthesia	
1945	Mario P. C. Storni	Study of the Influence of Epinephrine on Dogs Anesthetized with Cyclopropane	Essex, Lundy
1946	William N. Hardman	The Effects of Curare and Some Curare-like Drugs on Control Animals and on Animals Anesthetized with Various Anesthetic Agents	Essex, Lundy
1947	Albert Faulconer, Jr.	A Study for the Determination of Gas and Ether Vapor Tensions and the Use of These Methods During Semi-open Ether Anesthesia	Lundy, Boothby, Helmholtz, Wood, Code, Bateman, Latterell, and Jones
1947	John A. Paulson	I. A Comparison between Narcosis established by Sodium Ethyl (1-Methyl-Butyl) Thiobarbiturate (Pentobarbital Sodium) alone and combined with D-Tubocurarine Chloride (Curare) II. A Comparison between Narcosis established by Sodium-Ethyl (1-Methyl-Butyl) Thiobarbiturate (Pentothal Sodium) alone and combined with Alpha:Beta Dihydroxy-Gamma-(2-Methylphenoxy) Propane (Myanesin)	Essex, Lundy
1947	Kenneth E. Latterell	An Investigation of the Arterial Oxygen Saturation in Humans during Spinal Analgesia and Intravenous Pentothal Sodium Anesthesia as determined by the Millikan Oximeter and Van Slyke Gasometric Analysis of Arterial Blood	Wood, Lundy, Faulconer, and Code
1948	John R. Peterson	The Effect of Certain Vehicles on the Duration of Local Anesthesia with Procaine	Essex, Lundy
1948	Roger W. Ridley	Concentrations of Oxygen, Nitrous Oxide and Ether and their Correlation with Certain Physiologic Variables During Surgical Anesthesia in Man	Faulconer, Wood, Boothby, Code, Lundy, and Helmholtz
1949	Albert E. Keates	Clinical Effects of Drugs and Procedures in Anesthesia on Nailfold Capillaries	Roth, Lundy, Seldon, and Kubicek
1949	James F. Zagaria	Tolerance to Ether Anesthesia: Effect of Varying Nutritional States	
1949	Lowell M. Brooks	Studies on the Distribution and Fate of Pentothal Sodium Following Single Injection	Bollman and Lundy
1949	Cecil S. Jones	Arterial Blood Ether Concentrations in Human Subjects During Surgical Anesthesia - Use of the Mass Spectrometer for the Quantitative Determination of Ether Concentrations in Complex Gas Mixtures and in Blood Samples	Baldes, Lundy, and Brown
1949	Andrew E. Morrison	An Evaluation of Replacement Fluids in Laboratory Animals Following Controlled Hemorrhages	Essex, Lundy

1950	Raymond F. Courtin	Electroencephalography During Surgical Anesthesia with Nitrous Oxide, Oxygen and Ether	Bickford
1950	Anthony N. Fazio	Factors Influencing the Resistance of Albino Rats to Anoxic Anoxia	Lundy, Bollman, and Faulconer
1951	Donald E. Soltero	A Clinical Evaluation of Automatic Anesthesia	
1951	John S. Hattox	A New Method for the Analysis of Blood Nitrous Oxide and its Application in a Study of Anesthesia with this Agent	Faulconer, Devloo, Patrick, Helmholtz, Lundy, Baldes, Code, and Saari
1951	John E. Osborn	A Study of the Ether Vapor and Oxygen Tension in the Inspired Gas Mixtures during Anesthesia in Man	Faulconer, Ridley, Wood, Boothby, Helmholtz, Jones, Code, and Lundy
1951	Robert C. Knutson	Blood Volume Effects of Plasma Volume Expanders on Volemic Substances	Bollman, Lundy, Faulconer, and Flock
1952	Robert C. Hunter	A Study of Alveolar Ventilation and Acid-Base Balance in Patients Under Cyclopropane Anesthesia During Surgery	Faulconer, Helmholtz
1952	Donald K. Kiersey	A Clinical Study of Automatic Encephalographic Control of Thiopentone Anesthesia	Bickford, Faulconer
1952	Robert T. Patrick	The Application of a Mass Spectrometer Method for the Quantitative Determination of Carbon Dioxide and Oxygen in Blood to the Study of Certain Aspects of Ventilation and Acid-Base Equilibrium in Patients Undergoing Anesthesia with Ether and with Pentothal-Sodium	Code, Lundy, Ridley, Possati, Kiersey, Faulconer, Helmholtz, and Saari
1954	Serafino Possati	A Mass-Spectrometric Method for the Determination of Cyclopropane in Blood. Its Clinical Application in Relation to a Classification of the Electroencephalographic Patterns Occurring During Cyclopropane Anesthesia	Faulconer, Saari
1954	Ali Gharib	Influence of Demerol and Nembutal on Arterial Ether Blood Concentration in Man Undergoing Surgery	Faulconer
1955	Grant Fletcher	Hemodynamic Changes During Ether Anesthesia and Surgery in Man	Wood, Pender, and Kirklin
1955	E. Jay Fieldman	Hemodynamic Studies during Thiopental Sodium and Nitrous Oxide Anesthesia in Humans	Wood, Riley, Weidman, Swan, and Thompson
1955	Harry E. Taylor	A Comparison of the Effect of Chlorpromazine, Levo-Dromoran Tartrate, Valmid, and no Premedication on the Arterial Blood Ether concentration (EEG Level IV) in Man Undergoing Major Abdominal Surgery	Faulconer
1956	Luisita Reyes de Castro	Encephalography in Dogs During Ether Anesthesia, Correlation of Various Encephalographic Patterns with Ether Concentrations in the Arterial Blood at Normal Body Temperature and at 30 Degrees Centigrade	Faulconer, Bickford, Patrick, and Grindlay Fowler, Theye
1958	Conrad C. Buck	A Method Utilizing the Conventional Manometric Apparatus to Determine the Ether Content of Denitrogenated plasma of Patients Under Light Anesthesia	
1958	Emerson A. Moffitt	A Comparative Study of Blood Flow, Oxygen Saturation of Mixed Venous Blood, Blood Pressure and Peripheral Vascular Resistance During Whole Body Perfusion for Clinical Purposes and During Preoperative Cardiac Catheterization in Man	Wood, Patrick, Swan, Donald, and Kirklin
1959	Allan B. Gould, Jr.	A Study of Respiratory Impedance	Fowler, Theye
1960	Norbert Schnelle	Effects of Succinyl-Di-Choline on Respiration and Their Correlation with Changes of the Electrical Activity in Various Groups of Skeletal Muscle in the Cat	Fowler, Lambert, and Faulconer
1964	Maurice S. Albin	Selective Cooling of the Spinal Cord Utilizing Subarachnoid Perfusion	Lambert, Faulconer
1968	Joseph M. Messick, Jr.	The Effects of Meperidine and Pentobarbital on Canine Whole Body and Cerebral O <sub>2</sub> Consumption Rates	Theye, Faulconer, Fowler, and Michenfelder
1969	Bernard M. Altenburg	Demonstration of Acute Tolerance to Thiopental Sodium in Canine Cerebral O <sub>2</sub> Consumption Rate Studies	Theye, Fowler, Faulconer, and Michenfelder
1969	Sheila M. Muldoon	The Effects of Succinylcholine and Tubocurarine on Canine Whole Body and Skeletal Muscle O <sub>2</sub> Consumption Rates	Theye, Fowler, and Faulconer
1971	Klaus W. Kortzen	Kinetic Studies of the Acute Effects of Volatile Anesthetics on the Metabolism of Aniline and Aminopyrine	Van Dyke, Rebder
1991	Edmund G. Carton	Effects of Nitrous Oxide in Isolated Ventricular Myocardium of the Ferret	Kirkham, Housmans

\* Year of submission of master of science thesis.

In 1990, Dr. Duane K. Rorie (1936- ) became the next chairman of the division, and he was succeeded in 1991 by Dr. Gary C. Sieck (1948- ), the current chairman of the division of anesthesia research.

Dr. Albert Faulconer, Jr., understood the benefi-

cial impact of having a strong research component in his department. He knew that research in his department could provide an environment conducive to the development and intellectual growth of its staff and residents. Having productive researchers would also provide more visibili-



Fig. 3. Dr. Ward S. Fowler trained Drs. Theye, Michenfelder, and Rehder. Dr. Fowler was an eminent pulmonary physiologist who made lasting contributions to the field and was in large part responsible for the success of many members of the division of anesthesia research.

ty to his department, both intramurally and extramurally, and it would make the department more attractive to prospective staff and residents. Through his term as chairman, he strongly supported the development and growth of anesthesia research.

In 1955, Dr. Faulconer recruited Dr. Theye to the staff. Dr. Theye had completed his anesthesia training at the University of Indiana with Dr. Stoelting and had worked there as a clinical consultant. Dr. Theye came to the Mayo Clinic with the strong desire and determination to become a competent and independent investigator. Dr. Ward S. Fowler (1915-1982) (Fig. 3), a colleague and friend of Dr. Faulconer and an internationally respected pulmonary scientist, mentored Dr. Theye in his aspirations.

Dr. Fowler had come to the Mayo Clinic from the University of Pennsylvania in Philadelphia in 1952. There, he worked with Dr. Julius Comroe, a leading pulmonary physiologist, and had witnessed the productive collaboration between Dr. Comroe from the department of physiology and Dr. Dripps from the department of anesthesiology. Dr. Fowler continued the tradition of collaboration between physiologists and anesthesiologists at the Mayo Clinic. Throughout his career, he trained and supported vigorously the research

efforts by fellows and staff of the department of anesthesiology. Dr. Fowler was in large part responsible for the success of many members of the section of anesthesia research.

Dr. Theye worked in Dr. Fowler's laboratory for 5 years examining carbon dioxide (CO<sub>2</sub>) elimination and oxygen uptake by the lungs. He studied this in anesthetized dogs measuring the effects on CO<sub>2</sub> elimination of alternatively first occluding the left pulmonary artery or left bronchus or vice versa. He found that right-to-left shunting created by occluding the bronchus had a minor effect on CO<sub>2</sub> elimination, whereas the increase in dead space caused by occlusion of the pulmonary artery severely impaired CO<sub>2</sub> elimination. Dr. Theye and Dr. Fowler published their results in the *Journal of Applied Physiology*. Their work contributed significantly to the safe performance of thoracic surgery and anesthesia.

Using his expertise in pulmonary gas exchange, Dr. Theye later collaborated in studies on the performance of the vertical screen oxygenator of the Mayo-Gibbon extracorporeal bypass machine. This work was done with Dr. Fowler, Dr. John W. Kirklin (1917- ), a cardiac surgeon, and Mr. Richard E. Jones (1908-1997), head of the section of engineering at the Mayo Clinic. The results of this study allowed accurate predictions of the number of vertical screens of the oxygenator necessary for optimal oxygenation of the patient's blood. The insight gained from this study contributed significantly to the success of the open-heart surgical program at the Mayo Clinic.

Later in his career, Dr. Theye systematically examined the effects of general anesthetics on oxygen consumption of vital organs in animals. The research assistants and visiting scientists who trained and worked with Dr. Theye are identified in Table 2. Drs. Theye and Fowler were largely responsible for the subsequent successful research careers of Drs. Michenfelder and Rehder.

Dr. Moffitt, a cardiac anesthesiologist, prepared a master of science thesis under the guidance of

**Table 2.**  
Visiting Scientists and Research Assistants  
Trained in Dr. Richard A. Theye's Research Laboratory

Altenburg, Bernard M.
Messick, Joseph M., Jr.
Muldoon, Sheila M.
Rehder, Kai
Takeshita, Hiroshi



Fig. 4. Dr. Harold Jeremy C. Swan was one of Dr. Moffitt's advisors for his master of science thesis. Dr. Swan became famous through the development of the Swan-Ganz pulmonary artery flow-directed catheter.



Fig 5. Dr. Earl H. Wood was instrumental in the development of the Mayo-Gibbon extracorporeal bypass machine, strain gauges, densitometer, and the dynamic spatial reconstructor. Dr. Wood had a close professional relationship with many investigators of the department of anesthesiology and served as advisor for master of sciences theses.

Drs. Harold Jeremy C. Swan (1922- ) (Fig. 4), Robert T. Patrick (1920-1999), David E. Donald (1921- ), John W. Kirklin, and Wood (Fig. 5). The title of his 1958 thesis was *A Comparative Study of Blood Flow, Oxygen Saturation of Mixed Venous Blood, Blood Pressure and Peripheral Vascular Resistance During Whole Body Perfusion for Clinical Purposes and During Preoperative Cardiac Catheterization in Man*. This endeavor helped prepare Dr. Moffitt for his future career. Dr. Moffitt developed biochemical techniques to measure cardiac and whole body metabolism in patients undergoing open-heart surgery. He also worked on improving the cardiac metabolism of patients undergoing open-heart surgery. He performed these studies in collaboration with Dr. Ralph Goldsmith (1931- ).

Dr. Moffitt, together with Dr. Norbert Schnelle (1922- ), had the foresight to request research laboratory space for the department of anesthesiology, when the Alfred building was added to St. Marys Hospital in 1969. The research space was approved and became the first laboratory space officially assigned to the department of anesthesiology.

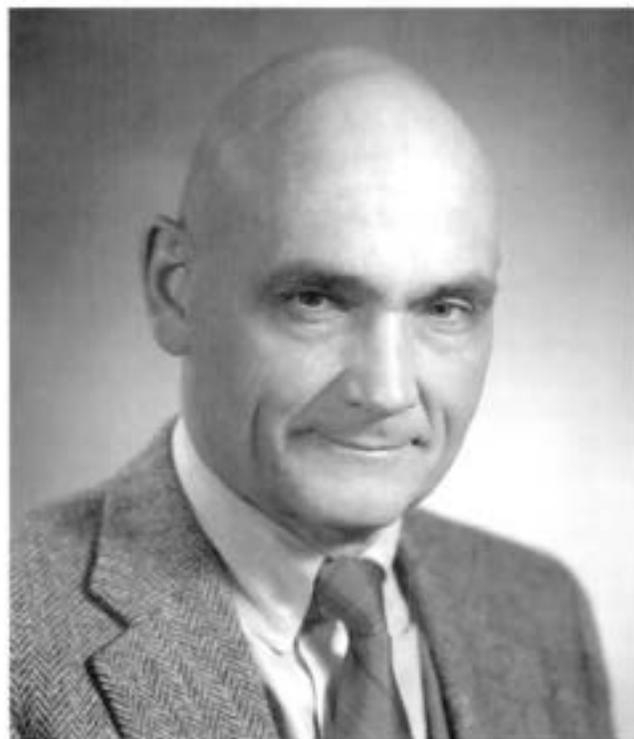
In 1964, Dr. Michenfelder began to work with Dr. Theye. After Dr. Rehder had joined the staff in 1966, it was agreed on Dr. Faulconer's suggestion that Dr. Michenfelder and Dr. Rehder should alternate doing research and working in the operating suite anesthetizing patients undergoing neurosurgery.

Dr. Michenfelder's long and productive research career could be divided into two categories: clinical and laboratory. The former was performed in the neurosurgical operating rooms and included characterizing some of the physiologic effects of hypothermia, developing new monitoring and therapeutic options to detect and treat venous air embolism, determining the intracranial pressure effects of various anesthetic agents and techniques, and defining the effects of various interventions on cerebral blood flow and the electroencephalogram during carotid endarterectomy. His laboratory activities focused on the cerebral effects of various anesthetic agents in both normal and stressed brains in anesthetized laboratory models. Much of the early work utilized a canine model for the direct measurement of cerebral blood flow and cerebral metabolic rate, which used a venous outflow technique that he and his technical supervisor, James Milde (1939- ), had developed and validated. Beginning in the late 1960s and continuing into the 1980s, the major thrust was directed at assessing the potential that various pharmaceutical agents and hypothermia had in protecting

**Table 3.**  
Visiting Scientists and Research Assistants  
Trained in Dr. John D. Michenfelder's Research Laboratory

Altenburg, Bernard M.
Artru, Alan A.
Christopherson, Thomas J.
Cucchiara, Roy F.
Fleischer, Jerry E.
Forsman, Marianne
Gisvold, Sven E.
Katusic, Zvonimir
Lanier, William L.
Messick, Joseph M., Jr.
Milde, Leslie N.
Nugent, Michael
Perkins, William J.
Roald, Ole K.
Stangland, Kenneth J.
Steen, Petter A.
Stulken, Edward H.
Takeshita, Hiroshi

brains stressed by ischemia or anoxia. Despite much controversy, his early studies demonstrating the failure of barbiturate therapy to protect the brain during and after cardiac arrest, as well as the metabolic basis for such failure, were even-



**Fig. 6.** Dr. Thor Sundt, chairman of the department of neurosurgery, worked closely with Dr. Michenfelder and his colleagues.

tually accepted and confirmed by others. Thereafter, many potential brain protective interventions were assessed. In other studies of induced hypotension, the potential for cyanide toxicity caused by the administration of sodium nitroprusside was recognized and quantified. Many of these studies focused on the effect of interventions on cerebral autoregulation, vascular reactivity to carbon dioxide, electroencephalogram, intracranial pressure, and the cerebral energy state. Dr. Michenfelder's work produced 110 original publications.

Dr. Michenfelder collaborated with many consultants of the Mayo Clinic, including Drs. Theye, Thor Sundt, (1930-1992) (Fig.6), Frank W. Sharbrough (1935- ), and Bernd W. Scheithauer (1946- ). Many visiting scientists and research assistants trained and worked in Dr. Michenfelder's laboratory (Table 3).

Dr. Rehder and his co-workers studied the physiology of mechanical ventilation of the lungs and the effects of anesthesia and muscle paralysis on the mechanical behavior of the respiratory system. These studies were performed mostly on volunteers in collaboration with Drs. Sessler, E. Paul Didier (1925- ), and Mr. Bernard P. Gilles (1930- ), a certified registered nurse anesthetist. Gerald J. Rach (1948- ), Darrell J. Petersen (1939- ), and Kathleen A. Street (1948- ) provided technical support for these demanding studies. Dr. Rehder demonstrated that the lungs and chest wall become stiffer (less compliant) after induction of anesthesia, that the position, shape and pattern of motion of the human diaphragm and the shape and pattern of motion of the thoracic wall are different in anesthetized-paralyzed than awake subjects, and that intrapulmonary distribution of inspired gas is different during mechanical ventilation than during spontaneous respiration. He postulated that changes in the shape of the chest wall (thoracic wall, abdominal wall, and diaphragm) are responsible for this altered pulmonary function during anesthesia. By contrast, intrapulmonary blood flow distribution was not affected by anesthesia. The altered gas distribution but unaltered blood flow distribution is one mechanism responsible for the increased mismatching of ventilation to perfusion and thus impaired pulmonary gas exchange during anesthesia. Dr. Rehder and colleagues were the first to suggest that the primary effect of anesthesia and muscle paralysis may be on the chest wall and not on the lungs themselves. Later in his career, Dr. Rehder and his co-workers examined the efficacy of high-frequency oscillation on intrapulmonary distribution of pulmonary blood flow by radioactive microspheres,



**Fig. 7.** Dr. Robert E. Hyatt, from the division of pulmonary and critical care medicine & internal medicine and the department of physiology and biophysics, worked closely with Dr. Rehder and his group. Dr. Hyatt was a leading pulmonary physiologist with a particular expertise in pulmonary mechanics. Dr. Hyatt was the principal investigator of a Program Project Grant from N.I.H.



**Fig. 9.** Dr. Eric L. Ritman, a member of the department of physiology and biophysics, succeeded Dr. Wood as director of the dynamic spatial reconstructor facilities. Dr. Ritman was the principal investigator of a Program Project Grant from N.I.H. supporting the dynamic spatial reconstructor.



**Fig. 8.** Dr. Joseph R. Rodarte was a member of the division of pulmonary and critical care medicine & internal medicine and the department of physiology and biophysics. He worked closely with Dr. Rehder and colleagues. Dr. Rodarte made significant contributions to the field of pulmonary mechanics and was an important member of the Program Project Grant from N.I.H., directed by Dr. Hyatt.

and the physiology and pharmacology of isolated airway smooth muscles.

Dr. Rehder collaborated with Drs. Fowler, Sessler, Robert E. Hyatt (1925- ) (Fig. 7), Joseph R. Rodarte (1938- ) (Fig. 8), Eric L. Rittman (1939- ) (Fig. 9), Philippe R. Housmans (1953- ), Kenneth C. Beck (1948- ), and Mr. Thomas J. Knopp (1938- ), all from the Mayo Clinic. He also worked with Drs. Johannes Piiper and Peter Scheid from the Max Planck Institute in Göttingen, Germany. Dr. Rehder held a joint academic appointment in the department of physiology and biophysics. Many visiting scientists and research assistants trained in his laboratory (Table 4), including Drs. David O. Warner (1957- ), Michael J. Joyner (1958- ), and Keith A. Jones, (1960- ), who became independent researchers in the division of anesthesia research at the Mayo Clinic.

Dr. Gronert joined the Mayo Clinic in 1966. Dr. Gronert examined the underlying mechanisms of malignant hyperthermia and became a respected expert in the field of malignant hyperthermia. After Dr. Theye became chairman of the department, he transferred the principal investigatorship of his N.I.H. grant to Dr. Gronert. Dr.

**Table 4.**  
Visiting Scientists and Research Assistants  
Trained in Dr. Kai Rehder's Research Laboratory

Abboud, Nabil
Beck, Kenneth C.
Beynen, Froukje M. K.
Boehlecke, Brian
Brichant, Jean-Francois
Brusasco, Vito
Cameron, Peter D.
Crawford, Matthew R.
Decramer, Marc L. A.
Fibuch, Eugene E.
Frazier, Arnold
Gelb, Adrian W.
Glenski, James A.
Hatch, David J.
Jones, Keith A.
Joyner, Michael J.
Juno, Philip
Kafer, Enid R.
Klineberg, Peter L.
Krayer, Sebastian
Landmark, Sandra J.
Lau, Hon-Ping
Lindahl, Sten G. E.
Mallow, James E.
Marsh, H. Michael
Rich, Charles R.
Sayiner, Abdullah
Scheidt, Monika E.
Schmid, Edith R.
Sittipong, Rungson
Southorn, Peter A.
Vettermann, Jörg
Warner, David O.
Wenthe, Fritz M.
Yamamoto, Kozo

Gronert resigned from the Mayo Clinic in 1986 to join the University of California, Davis.

In 1966, Dr. Rehder presented the results of a study on the biotransformation of halothane in humans, in which he had participated in Germany. After hearing this talk, Dr. Theye suggested that Dr. Rehder should visit Dr. Russell A. Van Dyke (1930- ) at Dow Chemical in Midland, Michigan, and seek to collaborate with him to further his experience in biochemistry and continue this line of research at the Mayo Clinic. Dr. Van Dyke, a biochemist, had demonstrated evidence for biotransformation of halothane in animals. The result of this visit was that Dr. Van Dyke joined the department of anesthesiology at the Mayo Clinic in 1968.

Dr. Van Dyke's laboratory at the Mayo Clinic began systematically to examine the hepatotoxicity noted in humans after the use of the volatile agent halothane. These studies involved the primary drug-metabolizing enzyme discovered in the late 1950s, cytochrome P-450. An animal (rat) model of the hepatotoxicity of halothane was developed in his laboratory. Using this model, Dr. Van Dyke elucidated the role of hypoxia and large anesthetic doses in the development of halothane toxicity. Parallel studies examined enzymatic dehalogenation, circadian rhythms, adrenergic receptors, heat shock proteins, a protein P-53, apoptosis, and nitric oxide. All of these factors were found to have a role in the hepatotoxicity of halothane. The studies involving heat shock proteins were critical to the discovery that the hepatotoxicity of halothane and similar chemicals is due to an immune-type reaction involving a metabolite of halothane and a rapidly inducible heat shock protein. The nitric oxide studies showed a profound effect of halothane on the synthesis and action of this vasodilator. Dr. Van Dyke collaborated with many scientists outside the Mayo Clinic, including Drs. M. W. Anders, E. I. Eger, S. M. Muldoon, J. Schenkman, A. Stier, M. Chopp, J. R. Trudell, and N. Matsumoto. Dr. Van Dyke had a joint academic appointment with the department of pharmacology.

Visiting scientists and research trainees who trained with Dr. Van Dyke in his research laboratory are listed in Table 5. Dr. Van Dyke retired from the staff of the Mayo Clinic in 1989 and joined Dr. H. Michael Marsh (1939- ), chairman of the department of anesthesiology, at the Henry Ford Hospital in Detroit, Michigan, where Dr. Van Dyke became director of research of the department of anesthesiology.

**Table 5.**  
Visiting Scientists and Research Assistants  
Trained in Dr. Russell A. Van Dyke's Research Laboratory

Baker, Max
Gandolfi, Jay A.
Iazzo, Paul A.
Kobylika, David
Korten, Klaus W.
Legler, Dwight C.
Nelson, David O.
Rorie, Duane K.
Sill, Christopher J.
Southorn, Peter A.
Widger, Larry A.
Wood, Catherine



Fig. 10. Dr. Paul M. Vanhoutte, from the department of physiology and biophysics, collaborated with Drs. Sheila M. Muldoon and Duane K. Rorie. Dr. Vanhoutte had an international reputation for his work on the physiologic control of vascular smooth muscle. He was a principal investigator of a project in the Program Project Grant from N.I.H. directed by Dr. Robert E. Hyatt.



Fig. 11. Dr. Gertrude M. Tyce collaborated with Drs. Sheila M. Muldoon and Duane K. Rorie. She contributed significantly to their work.

Dr. Sheila M. Muldoon (1935) was encouraged by Dr. Faulconer to do research with Dr. Richard K. Winkelmann (1924- ), in the department of dermatology. She soon became so interested in studying the physiology and pharmacology of vascular smooth muscle that she decided to obtain further training and experience in the laboratory of Dr. Paul M. Vanhoutte (1940- ) (Fig.10) in Belgium. After her return from Belgium, Dr. Muldoon established her own research laboratory in which she studied the effects of anesthetics on the function of isolated vascular smooth muscles. She collaborated with Drs. Vanhoutte and Gertrude M. Tyce (1927- ) (Fig.11). Dr. Muldoon also trained Dr. D.K. Rorie. Dr. Muldoon resigned from the staff of the Mayo Clinic in 1977 to become professor of anesthesiology and chairperson of the department of anesthesiology at the Uniformed Services University of the Health Sciences in Bethesda, Maryland. In Bethesda, Dr. Muldoon became interested in malignant hyperthermia and she became a recognized authority in this field of research.

Dr. Rorie continued and extended the work of Dr. Muldoon. He also worked closely with Dr. Tyce and with Dr. John T. Shepherd (1919- ) (Fig. 12). The focus of Dr. Rorie's research was to elucidate the interaction of volatile anesthetics with the autonomic nervous system. He demonstrated that the neuroeffector junction between the postganglionic sympathetic nerve fibers and



Fig. 12. Dr. John T. Shepherd collaborated with Drs. Sheila M. Muldoon, Duane K. Rorie, and Michael J. Joyner. Dr. Shepherd had an international reputation as an eminent cardiac and vascular physiologist.

**Table 6.**  
Visiting Scientists and Research Assistants  
Trained in Dr. Rorie's Research Laboratory

Barnes, Roxann D.
Cook, David J.
Hughes, David R.
Kamath, Gerard S.
Lunn, Jeffrey J.
Pettis, Michael S.

smooth muscle in blood vessels is an important site of action of anesthetic gases. Comparisons between contractile responses of isolated vascular smooth muscles before and during exposure to volatile anesthetics and other drugs used in anesthetic practice allowed conclusions to be drawn on the effects of anesthetics on the neuroeffector junction in blood vessels.

Studies in which stores of norepinephrine in the nerve endings of blood vessels were labeled with radioactive norepinephrine made it possible to measure the specific metabolites of norepinephrine. Comparisons between metabolites produced under control circumstances and during anesthesia elucidated the adverse effects of anesthetics on blood vessels. In the early 1980s, it was found that the endothelium that lines blood vessels was physiologically active, producing nitric oxide. Dr. Rorie, investigating this endothelium, demonstrated that it was active in the breakdown of norepinephrine. Other studies by Dr. Rorie showed that halothane altered blood vessel function by reducing the release of the co-transmitter neuropeptide Y, which facilitates the action of norepinephrine in establishing the proper tone in blood vessels. Residents trained in his research laboratory are listed in Table 6.

#### 4. Current Laboratory-Based Research Programs

In 1991, Dr. Sieck was appointed chairman of the division of anesthesia research. Currently, the division of anesthesia research has 10 laboratory-based research programs and is supported by multiple N.I.H. research grants and a N.I.H. research training grant. The activities in the research laboratories will be briefly discussed.

##### *Cell Imaging and Physiology Laboratory, Director Dr. Gary C. Sieck*

Dr. Sieck joined the division of anesthesia research in 1990. He brought with him a well-established and well-funded laboratory. The appointment of Dr. Sieck brought significant additional strength to the research activities of the division (Fig. 13).

Dr. Sieck's research focuses on the physiology of respiratory muscles, the diaphragm and its neuromotor control, and the excitation-contraction coupling in airway smooth muscle. Dr. Sieck's research in the plasticity of diaphragm neuromotor control can be categorized into three major areas: 1) alterations in contractile protein expression 2) alterations in mechanical performance of muscle fibers and 3) changes in phrenic motoneuron morphology and synaptic input. Using various sophisticated techniques, Dr. Sieck and his colleagues have examined the normal plasticity of diaphragm neuromotor control that occurs during early postnatal development. Although his studies are focused on characterizing plasticity in diaphragm neuromotor control, they can and have been used in many collaborative efforts between Dr. Sieck and other investigators, both within the department of anesthesiology and outside.



**Fig. 13.** Dr. Gary C. Sieck with members of his research laboratory

**Table 7.**  
Visiting Scientists and Research Assistants  
Trained in the *Cell Imaging and Physiology Laboratory*  
directed by Dr. Gary C. Sieck

Abraham, Theodore
Austrup, Mona L.
Best, Patricia J.
Boukatina, Anna E.
Brice, A. Glenn
Fatourech, Guitty
Fajarda, Elena Urgelles
Felleiter, Peter
Fenton, Alexis O.
Gosselin, Luc E.
Heunks, Leo M.
Hrometz, Sandra L.
Isbir, Olcay
Johnson, Bruce D.
Kahraman, Sibel Z.
Kannan, Mathur S.
Li, Li
Liopyris, Panyota
Machiels, Herwin
Masters, David B.
Megirian, David
Miyata, Hirofumi
Pabelick, Christina M.
Park, Jong-Kwan
Prakash, Y. S.
Regnier, Michael
Seckin, Inanc A.
Smithson, Kenneth
Togaiyeva, Anel A.
van Balkom, Roland
van der Heijden, Erik
Vandenboom, Rene
Vandersteen, David R.
Vantrappen, Ann
Wilson, Louise E.
Zacharias, David A.

In airway smooth muscle, Dr. Sieck has utilized the very sophisticated confocal imaging technique to explore the cell signaling pathways involved in the regulation of intracellular calcium concentration  $[Ca^{2+}]_i$ . In these studies, Dr. Sieck and his colleagues have characterized the dynamic regulation and compartmentalization of  $[Ca^{2+}]_i$  in the form of  $Ca^{2+}$  transients. They also have determined the involvement of  $Ca^{2+}$  release through inositol triphosphate and ryanodine receptor release channels in the sarcoplasmic

reticulum. Volatile anesthetics have a profound airway relaxant effect, and Dr. Sieck's laboratory has systematically evaluated the impact of volatile anesthetics on  $[Ca^{2+}]_i$  regulation. In addition, the mechanical coupling between elevated  $[Ca^{2+}]_i$  and airway smooth muscle contraction has been determined. Many visiting scientists and research assistants trained and worked in Dr. Sieck's laboratory (Table 7.).

***Smooth Muscle Physiology Laboratory, Co-Directors Drs. David O. Warner, Keith A. Jones, and William J. Perkins***

The research work of Drs. Warner, Jones, and William J. Perkins (1954- ) concentrates on the mechanism involved in the control of smooth muscle contraction. Unlike skeletal muscle, in which mechanisms regulating contraction are relatively well understood, little is known about the basic mechanisms regulating the contraction of smooth muscles. Several of the unique smooth muscle behaviors, such as the ability to contract to very short length and the ability to maintain force with very low energy expenditure, remain enigmatic, and they are the focus of the research in this laboratory. Anesthetic agents exert a significant part of their action by affecting the calcium sensitivity. Drs. Warner, Jones, and Perkins are investigating the underlying mechanisms by which anesthetic agents affect the calcium sensitivity. Visiting scientists and research assistants who have worked with Drs. Warner, Jones, and

**Table 8.**  
Visiting Scientists and Research Assistants Trained in the  
*Smooth Muscle Physiology Laboratory* co-directed by  
Drs. David O. Warner, Keith A. Jones, and William J. Perkins

Akao, Masaki
Bremerich, Dorothee H.
Fukushima, Tomihiro
Hanazaki, Motohiko
Hayashi, Yoshimura
Hirasaki, Akihito
Jankowski, Christopher
Kai, Tetsuya
Kwak, Young-Lan
Morimoto, Naoki
Pabelick, Christina
Rocchi, Danilo
Streff, John
Stuart-Smith, Karen
Wilson, Louise E.
Wong, Gilbert Y.
Yamamoto, Kozo
Yoshimura, Hayashi



Fig. 14. Drs. Philippe R. Housmans and James D. Hannon with members of their research laboratory

Perkins are listed in Table 8.

Dr. Warner and Dr. Mark A. Warner (1953- ) are the co-directors of the perioperative outcomes research group. The goal of the consortium of investigators forming this group is to provide appropriate support and guidance to perioperative outcome studies performed at the Mayo Clinic and to ensure that they will be recognized for their consistency.

**Cardiac Muscle Physiology and Pharmacology Laboratory, Co-Directors Drs. Philippe R. Housmans and James D. Hannon**

Drs. Housmans and James D. Hannon (1958- ) co-direct the cardiac muscle physiology and pharmacology laboratory (Fig. 14). The goal of their research is the elucidation of the cellular mechanism responsible for the myocardial depression by drugs used in clinical anesthesia. Anesthetic agents depress myocardial contractility by decreasing the availability of calcium ions in the cytoplasm of the cardiac myocardial cells, and in addition, some anesthetic agents can alter the sensitivity of the myocardial cells to calcium, with the result that the force developed during contraction is reduced for a given intracellular calcium concentration. The results of these studies are important for the design of strategies to develop drugs that have only desired and no unwanted effects.

Investigations are performed with various sophisticated techniques in isolated intact mammalian and amphibian cardiac muscle, isolated myocytes, skinned cardiac fibers, and isolated regulatory proteins such as troponin. Dr. Housmans has a joint academic appointment in the department of pharmacology. Visiting scientists

**Table 9.**

Visiting Scientists and Research Assistants Trained in the Cardiac Muscle Physiology and Pharmacology Laboratory co-directed by Drs. Philippe R. Housmans and James D. Hannon

Baele, Philippe, L.
Bartunek, Anna E.
Carton, Edmund G.
Cook, David J.
Hannon, James D.
Hosking, Michael P.
Jones, Keith A.
Kongsayreepong, Suneerat
Mattheussen, Maria
Murat, Isabelle

and research assistants who have worked in the cardiac muscle physiology and pharmacology laboratory are listed in Table 9.

**Vascular Molecular Biology Laboratory, Director Dr. Zvonimir S. Katusic**

Dr. Zvonimir S. Katusic (1952- ) joined the division of research in 1993. He had been a research fellow with Drs. Vanhoutte, Shepherd, and Michenfelder. In addition, he had been a Mayo Clinic Scholar in Research at the John Hopkins University in Baltimore, Maryland. Dr. Katusic's studies are focused on the vascular biology of nitric oxide in cerebral circulation. Nitric oxide released from vascular endothelial cells is a potent vasodilator and inhibitor of platelet aggregation, smooth muscle cell proliferation, and adhesion of white blood cells. In blood vessel walls, nitric oxide is produced by activation of nitric oxide-synthase. Impaired nitric oxide-biosynthesis has been implicated in the patho-

**Table 10.**  
Visiting Scientists and Research Assistants Trained in the  
*Vascular Molecular Biology Laboratory* directed by Dr.  
Zvonimir S. Katusic

Chen, Feng-Yuan
Cosentino, Francesco
D'Uscio, Lívius Vinzenz
Eguchi, Daihiko
Hempelmann, Ralf
Iida, Yasuhiko
Khurana, Gautam Z.
Kinoshita, Hiroyuki
Mertens, Luc L.
Mitrovic, Bora Srbislan
Onoue, Hisashi
Teutsui, Masato

genesis of a number of vascular diseases, including arteriosclerosis, thrombosis, restenosis, hypertension, diabetes mellitus, and vasospasm.

Dr. Katusic is interested in applying gene transfer technology to prevent and treat cerebrovascular diseases, including strokes, by developing approaches for delivery of recombinant nitric oxide-synthase genes to cerebral arteries in order to prevent cerebral vasospasm. He also has an interest in the mechanisms underlying oxidative stress on endothelial and smooth muscle cell function in cerebral arteries. Most recently, his studies have focused on the effects of oxidative stress and antioxidants on availability of the nitric oxide-synthase co-factor tetrahydrobiopterin, and its effects on enzymatic activity of endothelial nitric oxide-synthase. To address key questions, he uses mouse knockout models of endothelial dysfunction. Visiting scientists and

**Table 11.**  
Visiting Scientists and Research Assistants Trained in the  
*Human Integrative Physiology Laboratory* co-directed by  
Drs. Michael J. Joyner and Niki M. Dietz

Dietz, Niki M.
Engelke, Keith A.
Green, Daniel J.
Halliwil, John R.
Hebl, James D.
Hughson, Richard
Minson, Christopher T.
Proctor, David N.
Sujirattanawimol, Kittiphong
Torp, Klaus
Tschakovsky, Michael E.
Wieling, Wouter

research assistants of Dr. Katusic's laboratory are listed in Table 10.

***Human Integrative Physiology Laboratory,***  
***Co-Directors Drs. Michael J. Joyner and Niki***  
***M. Dietz***

Drs. Joyner and Niki M. Dietz (1961- ) study the interactions between reflex and local factors that govern the circulatory responses to physical and mental stress. Drs. Joyner and Dietz examine the cardiovascular responses of humans to thermal stress, exercise, orthostatic stress, and mental stress. Specifically, they are interested in the role of nitric oxide as a mediator of various vasodilatory responses and whether this nitric oxide is derived from the vascular endothelium or other sources. In addition, they study the competition among sympathetic vasoconstriction, active vasodilation, and local metabolic factors regulating blood flow to tissues. More recently, Dr. Dietz focused her interest on the gender-related differences in circulatory responses to stress and whether estrogen (endogenous or exogenous) has a role.

These studies in volunteers require sophisticated cardiovascular and neurophysiologic techniques. The volunteers are instrumented for intra-arterial drug infusions, measurements of blood flow to various tissues, cardiac output, oxygen uptake, and carbon dioxide elimination. Table 11 lists the visiting scientists and research assistants who worked in their laboratory.

***Biochemistry and Pharmacology Laboratory,***  
***Director Dr. Michael J. Murray***

Dr. Michael J. Murray's (1949- ) research focuses on ways to improve the nutritional status of critical ill patients and to elucidate the underlying mechanisms of anesthesia.

Acute lung injury is often associated with pulmonary hypertension and pulmonary edema. The mediators of these events include metabolites of dietary fatty acids. Dr. Murray identified a number of fatty acids that, when ingested, are incorporated into membranes of platelets, endothelial cells, and surfactants. The fatty acids can be released from the cell membranes and form metabolites that have potent vasoconstrictor activities. In vivo, Dr. Murray examined the response of animals, fed with selected fatty acids, to endotoxin. In vitro, he examined the effects of fatty acids on the vasoactivity of isolated blood vessels and determined the release of vasoactive compounds from these blood vessels.

Dr. Murray is also involved in developing a model to elucidate the actions of anesthetic agents. To this effect, he is studying the behavioral effects of inhalation anesthetics in

**Table 12.**

Visiting Scientists and Research Assistants Trained in the  
*Biochemistry and Pharmacology Laboratory* directed by Dr.  
Michael J. Murray

Ammari, Ramzi
Beers, Thomas
Bekele, Afessa
Browne, William T.
Dapkus, David
Iazzo, Paul
Javier, Aduen
Kanazi, Ghassan
Kumar, Muthuswami (Matthew)
Moukabary, Kamal
Moustafa, Gamal
Nahel, Saied
Nuttall, Gregory
Padakandla, Udaya
Tantivitayatan, Kamthorn
Tirnaktsiz, Mehmet B.
Tsao, Thomas Change-Yao
Werner, Eric
Zhang, Tao
Ziser, Avishai

drosophila to assess: 1) the analgesic effect of inhalation agents 2) the amnesic effects of anesthetics and 3) the neuromuscular relaxing effects of anesthetics. The visiting scientists and research assistants working with Dr. Murray are listed in Table 12.

### **Cellular Pharmacology Laboratory, Director Dr. J. Christopher Sill**

Dr. J. Christopher Sill (1950- ) demonstrated in isolated coronary blood vessels that isoflurane causes vasodilation and that this vasodilation is endothelium-dependent. By contrast, in intact dogs, isoflurane had no dilatory effect on epicardial coronary arteries. However, isoflurane dilated small coronary arteries and importantly increased coronary blood flow.

In other studies, Dr. Sill demonstrated that volatile anesthetics decreased the responsiveness of blood vessels to stimulation. More recently, he has shown, in cell cultures, that intracellular  $Ca^{2+}$  mobilization induced by cell stimulation can be inhibited by anesthetics. Dr. Sill has collaborated with Drs. Vanhoutte from the department of physiology and biophysics, and Drs. Van Dyke, Michael Nugent (1943- ), Gilbert A. Blaise (1947- ), and Brian Bertha (1959- ) from the department of anesthesiology. Drs. Rene Martin and He-Sun Song trained with Dr. Sill.

### **Cellular Toxicology and Biology Laboratory, Director Dr. Michael E. Johnson**

The research interest of Dr. Michael E. Johnson (1953- ) concerns the toxic effects that may occur in patients during the perioperative period. For instance, local anesthetics can injure neurons and interfere with wound healing. Dr. Johnson plans to determine the extent and the dose-response of the injury to local anesthetics and to elucidate the underlying mechanisms by which this occurs. In his studies, he uses cell culture models and subcellular fluorescent probes in combination with digitized video fluorescent microscopy and flow cytometry.

Dr. Johnson also is interested in determining the means of treating pulmonary hypertension. For

**Table 13.**

Visiting Scientists and Research Assistants Trained in the  
*Neuroanesthesia Research Laboratory* directed by  
Dr. William L. Lanier

Albrecht, Ronald F.
Cable, David G.
Christopherson, Thomas J.
Hofer, Roger E.
Iazzo, Paul A.
Karlsson, Bente R.
Keegan, Mark T.
Polis, Tomasz Z.
Rajala, Mary M.
Thompson, Matthew D.
Wagner, Stephen R.
Wass, C. Thomas
Weglinski, Margaret R.

this purpose, he is developing a pulmonary-specific vasodilator preparation that can be delivered via the pulmonary airways. He is currently testing various nitric oxide precursors. Another area of interest is the oxidative injury to endothelial cells and its modulation by volatile anesthetics.

### **Neuroanesthesia Research Laboratory, Director Dr. William L. Lanier**

The research of Dr. William L. Lanier (1955- ) involves study of the mechanisms by which the central nervous system may be injured in critically ill patients and of the prophylactic measures that may protect the brain from such injury. These studies include the effects of glucose and temperature on post-ischemic neurologic outcomes and the influence of muscle afferent activity on cerebral function. Dr. Lanier also has been involved, together with colleagues from the department of ophthalmology, in studies to iden-

**Table 14.**

Visiting Scientists and Research Assistants Trained in the *Cardiopulmonary Bypass Physiology Laboratory* directed by Dr. David J. Cook

Boston, Umar
Bryce, Rex
Dickerman, David
Foster, Steven
Liam, Beng Ling
MacVeigh, Ian
McGlinch, Brian
Plochl, Walter
Sungurtekin, Hulya

tify the determinants of retinopathy occurring in premature babies. Table 13 lists visiting scientists and research associates who worked with Dr. Lanier.

***Cardiopulmonary Bypass Physiology Laboratory, Director Dr. David J. Cook***

Research by Dr. David J. Cook (1958- ) is focused on elucidating the effects of cardiopulmonary bypass on the function of the brain. His studies in anesthetized dogs and pigs have examined various cardiopulmonary bypass techniques to ascertain their effects on cerebral oxygen consumption, cerebral blood flow, cerebral temperature, and cerebral oxygen delivery. Visiting scientists and research assistants who worked with Dr. Cook are listed in Table 14.

***Transfusion, Coagulation, and Cardiopulmonary Bypass Laboratory, Co-Directors Drs. Mark H. Ereth, Gregory A. Nuttall, William C. Oliver, and Paula J. Santrach***

Drs. Mark H. Ereth (1958- ), Gregory A. Nuttall (1960- ), William C. Oliver (1956- ), and Paula J. Santrach ( 1955- ) are studying perioperative coagulation, thrombosis, fibrinoly-

sis, platelet function, antifibrinolytic therapy, and intraoperative assessment of coagulation.

## 5. Conclusions

The division of anesthesia research remains strong. The close cooperation between members of the division and basic scientists is evidence for the quality of research and it guarantees excellence. Currently, close cooperation exists with Drs. Franklyn G. Prendergrast (1945- ), Eric D. Wieben (1950- ) and Claudia T. Kappen (1958- ) from the department of biochemistry and molecular biology, with Drs. Richard M. Weinshilboum (1940- ) and Steven G. Younkin (1944- ) from the department of pharmacology, with Drs Virginia M. Miller (1948- ), Steven M. Sine (1952- ), Emanuel E. Strehler (1954- ) from the department of physiology and biophysics, with Drs. Lorraine A. Fitzpatrick (1954- ), Michael D. Jensen (1955- ), K. Sreekumaran Nair (1947- ), Timothy O'Brien (1961- ), and Lawrence B. Riggs, Jr., (1931- ) from the division of endocrinology/metabolism & internal medicine, with Dr. Whyte G. Owen (1943- ) from the division of hematology & internal medicine, with Drs. Philip A. Low (1941- ) and Anthony J. Windebank (1948- ) from the department of neurology, Dr. Hartzell V. Schaff (1948- ) from the department of surgery, and Drs. Rolf D. Hubmayr (1949- ) and John A. McDonald (1943- ) from the division of pulmonary and critical care medicine & internal medicine. Clearly, the members of the division of anesthesia research contribute significantly to the intramural and extramural reputation of the department of anesthesiology and the department can be proud of their accomplishments.

*Kai Rehder*



## VII. Appendix

### **Presidents of the ASA**

Hattox, John S. (1980)  
Knight, Ralph T. (1953)  
Lundy, John S. (1946)  
MacKenzie, Ronald A. (2000)  
McCuskey, Charles F. (1948)  
Tovell, Ralph M. (1941)  
Tuohy, Edward B. (1947)

### **President of the American Society of Regional Anesthesia**

Wedel, Denise J. (1998)

### **Directors of the American Board of Anesthesiology**

Adams, R. Charles  
Faulconer, Albert, Jr. (1955 - 1969)  
Lundy, John S. (1938 - 1955)  
McCuskey, Charles F. (1940 - 1953)  
Patrick, Robert T. (1962 - 1974)  
Sessler, Alan D. (1977 - 1989)  
Theye, Richard A. (1969 - 1976)  
Tovell, Ralph M. (1938 - 1949)  
Tuohy, Edward B. (1950 - 1955)  
Warner, Mark A. (1999 - present)

### **Presidents of the Minnesota Society of Anesthesiologists**

Abenstein, John P. (1997)  
Atchison, Scott R. (1992)  
Byer, David E. (1985)  
Didier, Edward P. (1974)  
Gould, Allan B., Jr. (1971)  
Jones, Robert R. (1962)  
MacKenzie, Ronald A. (1991)  
Marsh, H. Michael (1987)  
Martin, John T. (1966)  
Messick, Joseph M., Jr. (1977)  
Moffitt, Emerson A. (1967)  
Osborn, John E. (1957)  
Pender, John W. (1953)  
Restall, Charles J. (1978)  
Seldon, Thomas H. (1949)  
Sessler, Alan D. (1982)  
Southorn, Peter A. (1989)  
Tarhan, Sait (1980)  
Warner, Mark A. (1995)

### **President of the Florida Society of Anesthesiologists**

Mackey, David C. (1999)

## **ASA Distinguished Service Award**

Lundy, John S.  
McCuskey, Charles F.  
Michenfelder, John D.

## **ASA Excellence in Research Award**

Michenfelder, John D.  
Rehder, Kai

## **Members of Editorial Board of *Anesthesiology***

Lundy, John S.  
McCuskey, Charles F.  
Michenfelder, John D., Editor-in-Chief  
Pender, John W.  
Rehder, Kai  
Rorie, Duane K.  
Seldon, Thomas H.  
Tovell, Ralph M.  
Warner, David O.

## **Members of Editorial Board of *Anesthesia and Analgesia***

Didier, Paul E.  
Martin, John T.  
Moffitt, Emerson A.  
Seldon, Thomas H., Editor-in-Chief  
Wedel, Denise J.

## **Named Professors — Mayo Foundation**

Rehder, Kai: Ruth and Vernon Taylor Professor  
Rorie, Duane K.: Reuben R. Eisenberg Professor

## **Distinguished Clinician—Mayo Foundation**

Tarhan, Sait

## **Chairpersons and Section / Department Designations**

### **Mayo Clinic Rochester**

<u>Date</u>	<u>Chairperson</u>	<u>Section/Department Name or Title</u>
1921	Labat	Special Anesthetist
1921 - 1923	Meeker	Anesthesia
1923	Meeker	Regional Anesthesia
1924 - 1931	Lundy	Regional Anesthesia
1931 - 1933	Lundy	Anesthesia
1933 - 1934	Lundy	Anesthesia and Intravenous Medication
1934 - 1945	Lundy	Anesthesia and Intravenous Therapy
1945 - 1952	Lundy	Anesthesiology and Intravenous Therapy
1952 - 1953	Adams	Anesthesiology and Intravenous Therapy
1953 - 1962	Faulconer	Anesthesiology and Intravenous Therapy
1962 - 1970	Faulconer	Anesthesiology
1971 - 1977	Theye	Anesthesiology
1977 - 1989	Sessler	Anesthesiology
1989 - 1991	Cucchiara	Anesthesiology
1991 - 1999	Rorie	Anesthesiology
1999 - present	M. A. Warner	Anesthesiology

## Mayo Clinic Jacksonville

<u>Date</u>	<u>Chairperson</u>	<u>Department Name or Title</u>
1986 - 1988	None	Anesthesiology
1988 - 1996	Harper	Anesthesiology
1996 - 2000	Lamer	Anesthesiology

## Mayo Clinic Scottsdale

<u>Date</u>	<u>Chairperson</u>	<u>Department Name or Title</u>
1987 - 1992	McMichan	Section of Anesthesiology
1992 - 1997	Lunn	Department of Anesthesiology
1997 - present	Milde	Department of Anesthesiology

## Administrators Assigned to Department in Rochester

Amery, William  
Brigham, Robert  
Jorgensen, Steve  
Kokesh, Tom  
Korsmo, Jeffrey  
Ostrander, John  
Smith, Kenneth  
Vilen, Hilton S.

## Chairs of University Departments

<u>Name</u>	<u>Institute</u>	<u>Location</u>
Baele, Philippe L.	Universite Catholique de Louvain	Brussels, Belgium
Brown, David L.	University of Iowa	Iowa City, Iowa
Brusasco, Vito	University of Genova	Genova, Italy
Courtin, Raymond F.	Baylor Medical Center	Dallas, Texas
Cucchiara, Roy F.	University of Florida	Gainesville, Florida
Fibuch, Eugene	University of Missouri	Kansas City, Missouri
Gelb, Adrian W.	University of London Ontario	London, Ontario, Canada
Hardman, William N.	Creighton University	Omaha, Nebraska
Hatch, David J.	Hospital for Sick Children, Great Ormand Street	London, U. K.
Herb, Isabella Coler	Rush Medical College	Chicago, Illinois
Knight, Ralph T.	University of Minnesota	Minneapolis, Minnesota
Lindahl, Sten G. E.	Karolinska Hospital and Karolinska Institute	Stockholm, Sweden
Marsh, H. Michael	Henry Ford Health System Wayne State University School of Medicine	Detroit, Michigan Detroit, Michigan
Martin, John T.	Ochsner Clinic Medical College of Ohio	New Orleans, Louisiana Toledo, Ohio
Moffitt, Emerson A.	Dalhousie Medical School	Halifax, Nova Scotia, Canada
Moriarty, Denis C.	University College	Dublin, Ireland
Mousel, Lloyd H.	George Washington University School of Medicine	Washington, D.C.
Muldoon, Sheila M.	Uniformed Services University of the Health Sciences	Bethesda, Maryland
Muralt, Isabelle	Hospital Trousseau	Paris, France
Nugent, Michael	Medical College of Ohio	Toledo, Ohio
Spoerel, Wolfgang E.	University of London, Ontario	London, Ontario, Canada
Steen, Petter A.	University of Oslo	Oslo, Norway

Takeshita, Hiroshi	Yamaguchi University	Ube, Yamaguchi, Japan
Tinker, John H.	University of Iowa and University of Nebraska	Iowa City, Iowa Omaha, Nebraska
Tuohy, Edward B.	Georgetown University School of Medicine	Washington, D.C.
Tuohy, Gerald	University of Missouri	Kansas City, Missouri

## **Academic Ranks at the Mayo Clinic**

### **Professor**

Brown, David L.; Cucchiara, Roy F.; Faulconer, Albert Jr.; Faust, Ronald J.; Gronert, Gerald A.; Joyner, Michael J.; Katusic, Zvonimir S.; Lanier, William L.; Leslie, John B.; Lundy, John S.; Messick, Joseph M. Jr.; Michenfelder, John D.; Milde, Leslie Newberg; Murray, Michael J.; Plevak, David J.; Räsänen, Jukka; Rehder, Kai; Rorie, Duane K.; Seldon, Thomas H.; Sessler, Alan D.; Sieck, Gary C.; Tarhan, Sait; Theye, Richard A.; VanDyke, Russell A.; Warner, David O.; Warner, Mark A.; Wedel, Denise J.; White, Roger D.

### **Associate Professor**

Abel, Martin D.; Adams, R. Charles; Chantigian, Robert Carl; Cook, David James; Dawson, Brian; Didier, Edward Paul; Dorsch, Jerry A.; Ereth, Mark H.; Gould, Allan B.; Hartridge, Virginia B.; Helmholz, Frederic H.; Horlocker, Terese T.; Housmans, Philippe Robert; Jones, Keith A.; Lennon, Robert L.; Leonard, Paul F.; Leone, Bruce James; Lindahl, Sten G. E.; McMichan, John C.; Marsh, H. Michael; Moffitt, Emerson A.; Nugent, Michael; Nuttall, Gregory A.; Prakash, Y. S.; Rettke, Steven R.; Sill, J. Christopher; Southorn, Peter A.; Stacy, Leda J.; Stein, Keith L.; Stevens, Rom Anthony; Tinker, John H.; Tuohy, Edward B.; Wang, Joseph K.; Wilson, Peter R.

### **Assistant Professor**

Abenstein, John P.; Atchison, Scott R.; Berge, Keith H.; Bertha, Brian George; Beynen, Froukje M. K.; Byer, David E.; Carney, Francoise M. T.; Carton, Edmund Gerard; Caswell, Renee E.; Cant, Wilbur F.; Danielson, David Robert; DeRuyter, Martin L.; Devloo, Robert A.; Dietz, Niki M.; Divertie, Gavin D.; Durant, Philippe A. C.; Elliot, Beth A.; Feinglass, Neil G.; Frasco, Peter E.; Grady, Robert E.; Grinton, Nancy Neher; Hall, Brian A.; Hall, Jerry A.; Hannon, James D.; Harper, James V.; Harrison, Barry A.; Hofer, Roger E.; James, Christopher F.; Johnson, Michael E.; Jones, Robert R.; Kamath, Gerard S.; Krabill, Donald R.; Krupin, Barbara R.; Lamer, Tim J.; Larson, Joel S.; LeBard, Scott Edward; Legler, Dwight C.; Leicht, Craig H.; Losasso, Thomas James; Lundborg, Richard O.; Lunn, Robert J.; MacKenzie, Ronald A.; Marshall, Kenneth A.; Martin, David P.; Mathison, Robert D.; McGregor, Diana G.; Mousel, Lloyd H.; Muir, Jesse J.; Muldoon, Sheila M.; Narr, Bradley J.; Nauss, Lee A.; Nelson, David O.; Ochs Kinney, Michelle A.; Oliver, William C.; Perkins, William J.; Perry, Lawrence B.; Poston, James G.; Poterack, Karl A.; Prentice, James A.; Raimundo, Hugo S.; Restall, Charles C.; Ronan, Kevin P.; Rose, Steven H.; Santrach, Paula J.; Schnelle, Norbert; Schwettmann, Rick S.; Shine, Timothy S. J.; Sittipong, Rungson; Sitzman, B. Todd; Spackman, Thomas N.; Stapelfeldt, Wolf H.; Strickland, Robert A.; Tovell, Ralph M.; Vasdev, Gurinder M. S.; Warner, Mary Ellen; Wass, C. Thomas; Weglinski, Margaret R.; Welna, Jeffrey O.; Wong, Gilbert Y.; Ziser, Avishai

### **Adjunct Assistant Professor**

Masters, David B. (University of Minnesota)

### **Instructor**

Adams, Robert W.; Banoub, Ashraf F.; Barnes, Roxann D.; Bazzell, C. Mark; Bechtle, Perry S.; Berger-Morgan, Ines; Bires, Jill Ann; Black, Susan; Boortz-Marx, Richard L.; Brown, Daniel R.; Brown, Michael J.; Burkle, Christopher M.; Carns, Paul Edward; Charnoff, Nina E.; Christianson, Lynn A.; Conover,

Margaret Ann; Crawford, Claudia C.; Dangler, Lori A.; Demczuk, Roxolana Joanne; DeRuyter, Marie L.; Findlay, James Y.; Fleischer, Jerry E.; Flick, Randall P.; Frie, Edward D.; Friedhoff, Robert J.; Fromme, Glenn A.; Gali, Bhargavi; Ghazi, Salim M.; Gray, John R.; Grigsby, Eric Jerome; Hagstrom, Susan Gardner; Hebl, James R.; Jankowski, Christopher J.; Johnston, Sharon R.; Janossy, Theodore A.; Kufner, Ronald P.; Kumar, Matthew M.; Kunkel, Steve E.; Lawrence, Van S.; Linstromberg, John Walter; Lunn, Jeffrey J.; Martin, Patricia A. C.; McCuskey, Charles F.; McGlinch, Brian Patrick; Muzzi, Donald A.; Noback, Carl Richardson; Osborn, John E.; Pender, John William; Pettis, Michael S.; Phillips, William James; Rehfeldt, Kent H.; Rho, Edwin H.; Rippeteau, Nicki D.; Rodenberg, Thomas J.; Sanders, Malcom S.; Scott, Kenneth Paul; Spaccarelli, Karen Campbell; Sperry, Mark S.; Stensrud, Paul E.; Torres, Norman E.; Torsher, Laurence C.; Trentman, Terrence L.; Villamaria, Frank Joseph, Vulkalcic, Lisa J.; Waggoner III, Julian R.; Weinmeister, Kent P.; Whitley, Mary Leitschuh; Wilson, Jack L.; Witzeling, Todd M.; Woodworth, Glenn E.; Zepeda, Fernando A.

**Record of Academic Rank not available**

Anderson, Bruce M.; Bell, Douglas G.; Brzica, Stephen M. Jr.; Conterato, James P.; Courtin, Raymond Frank; Daw, Edward F.; Doyle, John J.; Garrison, Robert C.; Herb, Isabella Coler; Hess, Todd Michael; Karanski, Stanley; Kimmel, George E.; Krohn, Jonathan S.; Labat, Louis Gaston; Lau, Carol Ann; Loberg, Douglas J.; Lutz, Lon J.; Martin, John T.; Martinson, Mark W.; Meeker, William R.; Murray, Janice Lynn; Patrick, Robert T.; Paulson, John A.; Psomas, Maria N.; Ridley, Roger W.; Springmann, Kurt Emil; Terry, Howard R. Jr.; Torres, Luis Eduardo Garcia; Tuohy, Gerald F.; Widger, Lorry A.; Wilkowski, Deborah Ann W.

## Staff

### **MARTIN DAVID ABEL, M.D.**

Dr. Martin David Abel was born in Johannesburg, South Africa, on Jan. 17, 1952. He received the M. B. B. Ch. degree in 1975 from the University of Witwatersrand, Johannesburg, South Africa, was certified as a fellow of the Royal College of Anesthetists of England (FRCA) in 1980, was certified by the American Board of Anesthesiology (ABA) in 1982, and in 1986, received special qualifications in critical care medicine by the ABA. Dr. Abel joined the staff of the department of anesthesiology at the Mayo Clinic in Rochester in 1982 and was promoted to associate professor in 1992. Dr. Abel introduced intraoperative echocardiography into the practice of cardiac surgery and anesthesiology. In 1996, Dr. Abel was appointed chair of the division of cardiovascular and thoracic anesthesia, and he continues to serve in that capacity. He and his wife Marilyn have four children.



### **JOHN P. ABENSTEIN, M.D.**

Dr. John P. Abenstein was born in Chicago, Illinois, on Oct. 18, 1955. He received the B. S. degree from Duke University, Durham, North Carolina (1976) and the M. S. degree in engineering from the University of Wisconsin, Madison (1978). He received the M.D. degree from Loyola Stritch School of Medicine, Chicago, Illinois, in 1981. Dr. Abenstein completed a residency in anesthesiology and a fellowship in cardiovascular anesthesiology at Michael Reese Hospital and Medical Center in Chicago in 1985. He was then assigned as a staff anesthesiologist to the Naval Hospital in Oakland, California. Dr. Abenstein was deployed with the United States Marine Corps on the U.S.S. Tarawa in 1986. Dr. Abenstein joined the Mayo Clinic staff in 1988, primarily assigned to the division of cardiovascular and thoracic anesthesiology. He was promoted to assistant professor of anesthesiology in 1991. He made significant contributions in modernizing and standardizing the monitoring and anesthesia delivery equipment and led the automated anesthesia record project. He was active in the residency program, serving as vice-chair of the program and chair of the clinical competency committee. His investigational interests included medical technology and outcomes research. Dr. Abenstein was certified by the American Board of Anesthesiology. He has worked in many institutional activities. Besides his work at the Mayo Clinic, Dr. Abenstein



was president of the Minnesota Society of Anesthesiologists and was both delegate and alternate district director to the American Society of Anesthesiologists. He served as delegate to the Minnesota Medical Association and on their legislative committee. He also served on the Medical Education and Research Costs Advisory Committee and as chair of the Health Technology Advisory Committee for the Minnesota Department of Health. He and his wife Sandra have two children.

### **R. CHARLES ADAMS, M.D.**

Dr. R. Charles Adams was born on Aug. 7, 1906, in Woolner, Ontario, Canada. He attended the Queen's University in Kingston, Ontario, from which he received the M.D. degree in 1931. Dr. Adams entered the Mayo Graduate School of Medicine as a fellow in anesthesiology in 1935. In 1937, he was appointed a consultant. In 1940, Dr. Adams was appointed an instructor of anesthesiology, was promoted to an assistant professor in 1945 and to an associate professor in 1948, and he received the M. S. degree in anesthesiology from the University of Minnesota, Minneapolis. Dr. Adams was head of the section of anesthesiology at the Mayo Clinic from 1952 to 1953. He was known as an authority on intravenous anesthesia, and he wrote a text on that subject. Dr. Adams was certified as an anesthesiologist by the American Board of Anesthesiology in 1939. He was a member of the board of directors of the American Society of Anesthesiologists and served as a member of the



house of delegates. Dr. Adams and his wife Elma Maude had two children. Their son Robert trained at the Mayo Clinic and joined the staff in anesthesiology. Dr. Adams died on Jan. 21, 1956.

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### **ROBERT W. ADAMS, M.D.**

Dr. Robert W. Adams was born on Mar. 4, 1941, in Rochester, Minnesota, and earned the M.D. degree from the University of Minnesota, Minneapolis, in 1967. After completing his fellowship at the Mayo Graduate School of Medicine from 1968 to 1971, Dr. Adams served 2 years of active duty at the U. S. Naval Hospital in San Diego, California, and then returned to Rochester as a consultant and an instructor in anesthesiology from 1973 until his resignation in 1974. He was certified by the American Board of Anesthesiology (ABA). During his fellowship year and as a consultant, Dr. Adams studied the effects of halothane and isoflurane on intracranial pressure in patients with space-occupying lesions. In 1974, Dr. Adams returned to San Diego and joined the Anesthesia Service Medical Group, serving as president from 1983 to 1988. Dr. Adams is a senior examiner for the ABA, and his interest in the Mayo Clinic continues as a member of the Board of Directors of the Mayo Alumni Association. Dr. Adams is the son of the



late Dr. R. Charles Adams (1906 - 1956), who was a Mayo Clinic anesthesiologist from 1937 to 1956 and served as the head of the section of anesthesiology during the early 1950s. Dr. Adams and his wife Karen have three children.

### **BRUCE M. ANDERSON, M.D.**

Dr. Bruce M. Anderson was born in Wild Rose, Wisconsin. He graduated from the New Mexico Military Institute in 1932. After graduation from Stanford University, Palo Alto, California, in 1934, he attended Stanford Medical School. In 1939, he became a fellow in anesthesiology at the Mayo Clinic, where he remained until 1942. In 1942, he submitted his M. S. thesis. After his resignation from the Mayo Clinic in 1945, he became chief of anesthesia for Alameda County Hospitals, Alameda, California, until 1949. He was an assistant clinical professor at Stanford University School of Medicine. He then practiced anesthesia as chief of anesthesiology at the Merritt Hospital until his retirement in 1977. He served as chief of the medical staff of the Merritt Hospital in 1962 and was president of the Alameda-Contra Costa Medical Association in 1975. Dr. Anderson and his wife Caroline had two children. Dr. Anderson died on Jan. 24, 1996.

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### **SCOTT R. ATCHISON, M.D.**

Dr. Scott R. Atchison was born on Dec. 18, 1953, in Fargo, North Dakota. He attended Concordia College in Moorhead, Minnesota, from 1972 to 1976 and received the B. A. degree. From 1976 to 1980, he studied medicine at the Mayo Medical School in Rochester, Minnesota, and received the M.D. degree in 1980. He then joined the Mayo Graduate School of Medicine as a resident in anesthesiology. In 1984, he was appointed a senior associate consultant in the department of anesthesiology, and in 1985, he was certified by the American Board of Anesthesiology. Dr. Atchison resigned from the staff in 1991. He and his wife Diane have two children.



### **ASHRAF F. BANOUB, M.D.**

Dr. Ashraf F. Banoub was born on June 12, 1965, in Alexandria, Egypt. He attended the University of Alexandria School of Medicine in Alexandria from 1982 to 1988. He served a rotating internship at the University of Alexandria from 1989 to 1990 and a surgical internship at Easton Hospital, Easton, Pennsylvania, from 1990 to 1991. He received training in anesthesiology at the Medical College of Ohio in Toledo, and in 1994, he came to the Mayo Clinic for fellowships in cardiovascular anesthesia and in critical care. In 1996, he was appointed a senior associate consultant at the Mayo Clinic. At the end of 1996, he resigned from the Mayo Clinic to join a private practice in Toledo, Ohio. Dr. Banoub is married and has two children.



### **ROXANN D. BARNES, M.D.**

Dr. Roxann D. Barnes was born on Nov. 15, 1963, in Rochester, Minnesota. She attended the University of Minnesota, Minneapolis/St. Paul, from 1982 to 1987. She obtained the B. S. degree in genetics and cell biology, graduating summa cum laude in 1987. She then went to California to attend Stanford University School of Medicine, Palo Alto, California, and obtained the M.D. degree from Stanford University in 1992. She interned in internal medicine at Santa Clara Valley Medical Center in San Jose, California. After completing medical school training, Dr. Barnes returned to her hometown of Rochester, Minnesota, for a 3-year residency in anesthesiology at the Mayo Clinic from 1993 to 1996, and a one-year fellowship in cardiac anesthesiology from 1996 to 1997. She was certified by the American Board of Anesthesiology in 1997. After her fellowship, she became an instructor of anesthesiology and a senior associate consultant at the Mayo Clinic in 1997. Her practice is in car-



diac anesthesiology, and she has a special interest in pediatric cardiac anesthesiology. Dr. Barnes is married and has three children, Alyssa, Burlyn, and Andrew.

### **C. MARK BAZZELL, M.D.**

Dr. C. Mark Bazzell was born on Aug. 3, 1959, in Louisville, Kentucky. He received a degree in marketing from the University of Kentucky College of Business and Economics in Lexington in 1985. Dr. Bazzell served as executive director on the staff of Governor Martha Layne Collins during the late 1980s. He entered the University of Kentucky College of Medicine in Lexington in the fall of 1990 and graduated in 1994. Dr. Bazzell completed an internship at Mercy Hospital in Pittsburgh, Pennsylvania, and a residency in anesthesiology at Baystate Medical Center in Springfield, Massachusetts. He served a fellowship in critical care medicine at the University of Florida Shands Medical Center in Gainesville and was appointed to the Mayo Clinic staff in 1999.



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### **PERRY S. BECHTLE, D.O.**

Dr. Perry S. Bechtle was born on Feb. 13, 1961, in Bryn Mawr, Pennsylvania. After his undergraduate education at Temple University, Philadelphia, and the University of Delaware, Newark, he received the B. A. degree in biological sciences in 1984 from the latter institution. From 1985 to 1989, he attended the College of Osteopathic Medicine in Philadelphia and received the D. O. degree in 1989. Following a rotating internship at Sun Coast Hospital in Largo, Florida, he served in the U. S. Navy as a flight surgeon from 1990 to 1995 and then completed a residency in anesthesiology at Thomas Jefferson University Hospital in Philadelphia. During 1997, he completed a fellowship in neuroanesthesiology at the Mayo Clinic. That year he was appointed a senior associate consultant at the Mayo Clinic in Jacksonville, Florida. He and his wife Beth have two children.



### **DOUGLAS G. BELL, M.D.**

Dr. Douglas G. Bell was born on July 29, 1958, in De Smet, South Dakota. He graduated summa cum laude from Augustana College, Sioux Falls, South Dakota, in 1980. He then studied medicine at the University of South Dakota School of Medicine (Vermillion) from 1980 and earned the M.D. degree in 1984. He entered the Mayo Graduate School of Medicine in 1984 as a resident in anesthesiology. In 1987, he was appointed a senior associate consultant at the Mayo Clinic. He is certified by the American Board of Anesthesiology. He resigned from the Mayo Clinic in 1988. He and his wife Gaye reside in Sioux Falls, South Dakota.



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### **KEITH H. BERGE, M.D.**

Dr. Keith H. Berge was born on Nov. 28, 1958, in Rochester Minnesota. His father, Kenneth, was a member of the Mayo Clinic staff for many years. Keith attended college at the University of Minnesota, Minneapolis, graduating with the B.S. degree in microbiology. After attending Mayo Medical School, he continued training in anesthesiology, finishing with a fellowship in critical care medicine. The last 6 months of his fellowship were served at the Queen Elizabeth Medical Centre in Perth, Western Australia. He was certified by the American Board of Anesthesiology. Dr. Berge's career has concentrated in the areas of critical care medicine, neuro-anesthesia, and intensive care. He has served as co-chair of the Mayo Clinic Ethics Committee from the time of its inception and has been active in ethics education for the Medical School and Graduate School of Medicine. Dr. Berge and his



wife Johanna have two children, Nicholas and Jennifer.

### **INES BERGER, M.D.**

Dr. Ines Berger was born on Feb. 19, 1961, in Wolfsburg, Germany. She attended the Theodor Heuss Gymnasium in Wolfsburg and then studied medicine at the Friedrich-Alexander University in Erlangen and the Philipps University in Marburg, both in Germany. She earned the M.D. degree in 1986. She completed a research fellowship in experimental surgery at the Friedrich-Alexander University in Erlangen in 1989. From 1989 to 1990, she served an internship in the Mayo Graduate School of Medicine, which was followed by a residency in anesthesiology from 1990 to 1993 and a fellowship in critical care medicine from 1993 to 1994. From 1994 to 1995, she completed an additional fellowship in clinical anesthesiology at Rupprechts-Carl-University, Heidelberg, Germany. She then became a staff anesthesiologist at the Veterans Administration Medical Center in Buffalo, New York, and an assistant professor of anesthesiology at the State University of New York, Buffalo. In 1997, she did a fellowship in pain medicine at the Mayo Graduate School of Medicine. Dr. Berger was certified by the American Board of



Anesthesiology in 1994 and received the subspecialty certification in critical care medicine in 1995. Dr. Berger is currently a consultant and an assistant professor of anesthesiology in the Mayo Medical School. She is widowed and has two children.

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### **BRIAN GEORGE BERTHA, M.D.**

Dr. Brian George Bertha was born in Milwaukee, Wisconsin, on Apr. 28, 1959. He completed his undergraduate work at the University of Wisconsin in Madison, earning the B. S. degree with honors in molecular biology in 1981. He received the M.D. degree in 1986 from the University of Wisconsin Medical School (Madison). He was certified by the American Board of Anesthesiology. He joined the staff of the department of anesthesiology at the Mayo Clinic in Rochester as a senior associate consultant in 1990. He resigned from the Clinic in 1991. He is married to a psychiatrist, Dr. Maryann Evans, a Mayo Alumna. Dr. Bertha and Dr. Evans have two children. They reside in Great Falls, Montana.



### **FROUKJE M. K. BEYNEN, M.D.**

Dr. Froukje Beynen was born on Aug. 31, 1938, in Surabaya, Indonesia. She attended the Municipal Gymnasium in Utrecht, Netherlands, and studied medicine from 1958 to 1965 at the University of Utrecht. In 1965, she received the M.D. degree. After her internship at the University of Utrecht, she served residencies at the Habor Hospital in Hamburg, Germany, and at the Firestone Medical Center in Harbel, Liberia. In 1972, she began her residency in anesthesiology at the University of Groningen, Netherlands, and later continued at the Mayo Graduate School of Medicine. In 1977, she completed a fellowship in pediatric anesthesiology at the Great Ormond Street Hospital for Sick Children, London, England. Dr. Beynen was appointed a consultant at the Mayo Clinic, Rochester, in 1978 and an assistant professor of anesthesiology in the Mayo Medical School. In



1992, she transferred to the Mayo Clinic, Scottsdale, Arizona.

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### **JILL ANN BIRES, M.D.**

Dr. Jill Ann Bires was born on June 30, 1955, in Wilkesburg, Pennsylvania. After her graduation from the University of Pittsburgh with the B.S. degree, (summa cum laude) in 1977, she received the M.D. degree from the same institution in 1981. She served her internship from 1981 to 1982 and her residency in pediatrics from 1982 to 1984 at the Children's Hospital in Pittsburgh, Pennsylvania. This experience was followed by a fellowship in pediatric anesthesia and critical care at the same institution. She was certified by the American Board of Pediatrics and the American Board of Anesthesiology. In September 1987, she was appointed a senior associate consultant at the Mayo Clinic in Rochester. She resigned from the Mayo Clinic in May 1991.



### **SUSAN BLACK, M.D.**

Dr. Susan Black was born on Dec. 24, 1957, in Tallahassee, Florida. She did her undergraduate work at the University of Alabama, Tuscaloosa, from 1975 to 1979. She received the M.D. degree from the University of Alabama, in 1983. She began a residency in surgery at the Mayo Graduate School of Medicine and completed her training in anesthesia and a fellowship in neuroanesthesia at the Mayo Clinic in 1984. She was certified as a Diplomate of the American Board of Anesthesiology. In 1987, she was appointed a senior associate consultant. She resigned from the Mayo Clinic in 1989. She is married to Dr. Mark Trankina, who is also an anesthesiologist. Currently, they serve on the faculty of the University of Florida in Gainesville.



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### **RICHARD L. BOORTZ-MARX, M.D.**

Dr. Richard L. Boortz-Marx was born on Sept. 2, 1951, in LaCrosse, Wisconsin. He attended the University of Health Sciences College of Osteopathic Medicine (Kansas City, Missouri), from 1987 to 1989 and then the Wayne State University School of Medicine, Detroit, Michigan, from 1989 to 1991. He served a transitional internship from 1991 to 1992 and a residency in neurology from 1992 to 1993 at the University of Minnesota Hospitals and Clinics in Minneapolis. In 1993, he began his residency in anesthesiology at the University of Minnesota Hospitals and Clinics. In June 1996, he began a fellowship in the division of pain services at the Mayo Graduate School of Medicine. In 1997, he was appointed a senior associate consultant. He resigned from the Mayo Clinic on June 25, 1999. He and his wife Cynthia, a certified registered nurse anesthetist, have two children.



### **DANIEL R. BROWN, M.D., Ph.D.**

Dr. Daniel R. Brown was born on May 2, 1964, in St. Paul, Minnesota. He received the Ph.D. degree in 1991 and the M.D. degree in 1993, both from the Medical College of Wisconsin (Milwaukee). His training in anesthesiology, including a fellowship in critical care medicine was done at the Johns Hopkins Hospital, Baltimore, Maryland. After his training, Dr. Brown joined the Mayo Clinic in the department of anesthesiology as a senior associate consultant and an instructor of anesthesiology in 1998. He was certified by the American Board of Anesthesiology (ABA) in 1998 and was certified by the ABA in 1999 with special qualifications in critical care medicine. He was awarded a 2-year research grant by the Foundation for Anesthesia Education and Research (1997 to 1999). Dr. Brown is married to Heidi, and they have two children, Hannah and Wesley.



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### **DAVID L. BROWN, M.D.**

Dr. David L. Brown was born on May 31, 1950, in Ames, Iowa. He received the M.D. degree from the University of Minnesota (Minneapolis) in 1978. In 1982, he completed a residency in anesthesiology at Wilford Hall U. S. A. F. Medical Center in San Antonio, Texas. Subsequently, he practiced and was chief of anesthesia at the Virginia Mason Medical Center in Seattle, Washington. In 1990, he moved to Rochester, Minnesota. He was certified by the American Board of Anesthesiology. In 1990, he was appointed an associate professor of anesthesiology, and in 1995, he became a professor of anesthesiology in the Mayo Medical School. Dr. Brown's clinical and teaching interests concern regional anesthesia and pain medicine. Dr. Brown left Rochester in 1997 to become professor and head of the department of anesthesia at the University of Iowa in Iowa City. Dr. Brown is



married to Kathryn Munger Brown, and they have two children, Sarah and Cody.

### **MICHAEL J. BROWN, M.D.**

Dr. Michael J. Brown was born on Aug. 27, 1969, in Rochester, Minnesota. He attended the University of Wisconsin (Madison), from which he received the B. S. degree in pharmacology and toxicology in 1991. Dr. Brown attended the University of Minnesota Medical School (Minneapolis) and received the M.D. degree in 1995. He completed his internship at St. Luke's Medical Center in Milwaukee, Wisconsin, in 1996. Dr. Brown entered the Mayo Graduate School of Medicine as a resident in anesthesiology in 1996. In 1999, he was appointed a senior associate consultant and an instructor of anesthesiology in the Mayo Medical School. Dr. Brown is married to Julie Rae. They have no children.



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### **STEPHEN M. BRZICA, JR., M.D.**

Dr. Stephen M. Brzica, Jr., was born on May 8, 1945, in Sioux Falls, South Dakota. He attended Creighton University in Omaha, Nebraska, and earned the M.D. degree in 1970. After a year of internship at the University of Missouri, Kansas City, he entered the residency program in anesthesia at the Mayo Graduate School of Medicine in 1971 completing it in 1974. He then accepted a residency in blood banking in the department of pathology at the Mayo Clinic from 1974 to 1975. He was certified by the American Board of Anesthesiology in 1975 and by the American Board of Pathology in blood banking in 1976. From 1975 to 1978, he was a consultant at the Mayo Clinic, with a dual appointment in anesthesia and pathology. He is the author of numerous papers published on the subject of transfusion medicine and its relationship to anesthesia, as well as an author of a chapter on that subject in the first and second editions of *Anesthesia* by R. D. Miller. In 1978 he founded ambulatory surgical centers in St. Paul, Minneapolis, and Edina, Minnesota, where he currently is an anesthesiologist in private practice. Dr. Brzica has served on the board of directors of the Memorial Blood Centers of Minnesota in Minneapolis from 1981



to the present and served as president of that board from 1993 to 1995. He was the recipient of the Presidential Award for Outstanding Vision and Leadership and also received the 1996-1997 Service Award of the Memorial Blood Centers of Minnesota. Dr. Brzica is active in many community organizations. He is married to Sheila Carey and is the father of five children.

### **CHRISTOPHER M. BURKLE, M.D.**

Dr. Christopher Burkle was born in New Haven, Connecticut, on Aug. 9, 1963. He graduated from Lewis and Clark College (Portland, Oregon) with the B. S. degree in biology. After completing a tour of duty in the U. S. Navy, he returned to school to complete the B. S. degree in mechanical engineering from Portland State University (Portland, Oregon). He graduated from the University of Hawaii Medical School (Honolulu) in 1994 and completed a residency in anesthesiology at the Mayo Clinic in 1998. After a brief period of private practice in Hawaii, he returned to the Mayo Clinic and was appointed a senior associate consultant in 1999.



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### **DAVID E. BYER, M.D.**

Dr. David E. Byer was born on Sept. 7, 1942, in Hamlin, Kansas. He attended the University of Kansas (Lawrence) where he received the A. B. degree in 1960 and the M.D. degree in 1963. He completed his internship at Wesley Medical Center in 1968. At that time, Dr. Byer spent 2 years in the alternate service department, providing medical care at the Macha Hospital in Choma, Zambia. After his military service, he completed a residency in anesthesiology at the Mayo Graduate School of Medicine in 1973. Dr. Byer has been a consultant at the Mayo Clinic since 1973. He has pursued his interest in organized medicine through elected offices in the American Society of Anesthesiologists, Minnesota Medical Association, Minnesota Society of Anesthesiologists, and the Zumbro Valley Medical Society. He was certified by the American Board of Anesthesiology in 1974. Dr.



Byer is married to Jean, and they have six children.

### **WILBUR F. CANT, M.D.**

Dr. Wilbur (Bill) Cant was born in Moline, Illinois, on Nov. 5, 1931. He received the M.D. degree from the University of Illinois, College of Medicine in Chicago, Illinois, in 1957. He interned at San Diego County General Hospital in San Diego, California, from 1957 through 1958. From 1958 to 1960, he served in the U. S. A. F. (MC), and in 1960, he began a residency in pediatrics at Milwaukee Children's Hospital, Milwaukee, Wisconsin. After completing his training in 1962, he entered private practice in Madison, Wisconsin. In 1963, he was certified by the American Pediatric Board. In 1964, he moved to Red Wing, Minnesota, and practiced pediatrics until 1972. Thereafter, he began a fellowship in anesthesiology at the Mayo Clinic, and in 1977, he was appointed an assistant professor of anesthesiology in the Mayo Medical School. Dr. Cant was certified by the American Board of Anesthesiology in 1976. In November 1977, Dr. Cant resigned from the Mayo Clinic to become co-founder of the first free-standing ambulatory surgery center in Minneapolis/St. Paul, St. Paul Surgery Center. Subsequently, he was medical



director and anesthesiologist at Centennial Lakes Surgery Center in Edina, Minnesota, and ended his career as medical director and anesthesiologist at Health Partners Same Day Surgery Center in St. Paul. He retired from active practice in 1997. Currently, he resides in Shoreview, Minnesota, with his wife Barbara. He has four daughters and five grandchildren.

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### **FRANCOISE M. T. CARNEY, M.D.**

Dr. Francoise M. T. Carney was born on Feb. 16, 1935, in Mauritius. She attended the University College Faculty of Medicine in Dublin, Ireland, and received the M. B. B. Ch. degree from that institution. After her internship at St. Vincent's and St. Kevin's hospitals in Dublin and a residency in anesthesiology at St. Kevin's Hospital (1961-1962), she became a fellow in anesthesiology in the Mayo Graduate School of Medicine (1962-1964). She joined the staff at the Mayo Clinic as consultant in 1965. Dr. Carney resigned from the staff in 1979. She was married to Dr. J. Aidan Carney, a surgical pathologist at the Mayo Clinic. Dr. Francoise Carney died on Oct. 21, 1981.



### **PAUL EDWARD CARNS, M.D.**

Dr. Paul Edward Carns was born in Cleveland, Ohio, on Dec. 9, 1952. He was awarded the B. S. degree from Ohio State University, College of Pharmacy, Columbus, in 1976 and practiced in Ohio as a registered pharmacist until 1991. In 1993, Dr. Carns received the M.D. degree from the Medical College of Ohio in Toledo. He completed his internship and residency at the Mayo Graduate School of Medicine in 1997, furthering his training at the Mayo Institution by completing a fellowship in pain management in 1998. Also, in 1998, Dr. Carns became a Diplomate of the American Board of Anesthesiology and was appointed to the Mayo Clinic staff as a senior associate consultant and an instructor of anesthesiology in the Mayo Medical School. Since 1998, Dr. Carns has served as medical director of the inpatient pain service at Mayo Medical



Center, Rochester. Dr. Carns and his wife Bridget have two daughters.

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### **EDMUND GERARD CARTON, M.D.**

Dr. Edmund Gerard Carton was born on May 28, 1955, in Cork, Ireland. In 1973, he matriculated at the Kevin Street College of Technology in Dublin, Ireland. He studied medicine at Trinity College of the University of Dublin (1974 to 1980), from which he received the M. B. degree in 1980. From 1980 to 1981, he was an intern in medicine at Sir Patrick Duns Hospital in Dublin, and from 1981 to 1982, he was senior house officer at the Mercer Hospital and St. Luke's Hospital in Dublin. Between 1982 and 1987, he had further professional training at various hospitals in Dublin. In 1987, he became a fellow of the Faculty of Anaesthetists of the Royal College of Surgeons in Ireland. In 1988, he entered the Mayo Graduate School of Medicine as a fellow in transplant anesthesia, critical care, and anesthesiology research. In 1990, he was certified by the American Board of Anesthesiology, and in 1991, he was awarded special qualifications in critical care. In 1990, he was appointed a senior associate



consultant and assistant professor of anesthesiology in the Mayo Medical School. He resigned from the Mayo Clinic in 1993 to become a consultant in Dublin, Ireland.

### **RENEE E. CASWELL, M.D.**

Dr. Renee E. Caswell was born on Feb. 18, 1956, near Lindstrom, Minnesota. In 1978, she received the B. A. degree in business administration, magna cum laude, from Moorhead State University in Moorhead, Minnesota. She then moved to Vail, Colorado, where she worked in the real estate business, after which she entered the University of Colorado for her premedical studies and then attended medical school at the University of Colorado Health Sciences Center in Denver. She was elected to Alpha Omega Alpha in 1988 and was awarded the M.D. degree in 1989. She served an internship from 1989 to 1990 and a residency from 1990 to 1993 at the Mayo Graduate School of Medicine, with special emphasis on pain management. After completing her residency, she joined the staff of the Mayo Clinic in 1993, initially in Rochester, and then from 1997 in Scottsdale, Arizona. Dr. Caswell is certified by the American Board of



Anesthesiology. She has worked in many subspecialties of anesthesia and in the pain clinic. Dr. Caswell and her husband Steven have two children.

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### **ROBERT CARL CHANTIGIAN, M.D.**

Dr. Robert Carl Chantigian was born on Jan. 26, 1951, in Philadelphia, Pennsylvania. Dr. Chantigian graduated from Temple University in Philadelphia, receiving three degrees (B. A. degree in mathematics in 1972, B. S. degree in pharmacy in 1975, and M.D. degree in 1979). In 1979, he came to the Mayo Clinic for an internship and residency in anesthesia, which were completed in 1982. This training was followed by a fellowship in obstetric anesthesia at the Brigham and Women's Hospital in Boston, Massachusetts, and a fellowship in pediatric anesthesia at the Children's Hospital National Medical Center in Washington, D. C. He joined the staff at the Brigham and Women's Hospital for 2 years before joining the staff at the Mayo Clinic in 1985. Dr. Chantigian was certified by the American Board of Anesthesiology. When he joined the staff in 1985, Dr. Alan Sessler asked him to improve the department's relationship with the obstetricians. In this capacity, Dr. Chantigian was the director of obstetric anesthesia at the Mayo Clinic for 8 years. Currently, he



is an associate professor of anesthesiology in the Mayo Medical School. During his anesthesia career, he has received teaching awards six times and one award as a distinguished clinician. He and his wife Paula, who is an obstetrician, have four children.

### **NINA E. CHARNOFF, M.D.**

Dr. Nina Charnoff was born on June 2, 1956, in New York, New York. She attended Barnard College of Columbia University (New York, New York) and received the B. A. degree in comparative religion in 1977. In 1977, she began her medical studies at State University of New York in the Downstate Medical Center, Brooklyn, New York, and earned the M.D. degree in 1981. She served an internship at the Memorial-Sloan Kettering Cancer Center (New York, New York) and a rotating internship in the department of anesthesiology at the New York Hospital-Cornell Medical Center (New York, New York). She then served a residency at the New York Hospital-Cornell Medical Center and at the University Hospital, Boston University School of Medicine. From 1984 to 1985, she served a fellowship at the Children's Hospital in Boston. Dr. Charnoff was certified by the American Board of Anesthesiology in 1987. She was appointed a consultant at the Mayo Clinic, Rochester, in the



department of anesthesiology in 1993 and an instructor of anesthesiology in the Mayo Medical School. She is married to Peter Berger, a cardiologist at the Mayo Clinic. They have two children.

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### **LYNN A. CHRISTIANSON, M.D.**

Dr. Lynn A. Christianson was born on July 10, 1949, in St. Peter, Minnesota. He received the B.A. degree, cum laude, from the Claremont Men's College in Claremont, California, in 1971. He then was at the University of Colorado in Boulder, Colorado, from 1971 to 1972, in the department of molecular, cellular, and developmental biology. From 1975 to 1979, he attended the University of Minnesota (Minneapolis), from which he received the M.D. degree. He served an internship in internal medicine at the Parkland Memorial Hospital & Dallas Veterans Administration Hospital in internal medicine. In 1980, he joined the Mayo Graduate School of Medicine as a resident in anesthesiology. In 1982, he began a fellowship at the Children's Hospital of Philadelphia as a Mayo Foundation Scholar. He was certified by the American Board of Anesthesiology. In 1983, he was appointed a consultant and an instructor of anesthesiology in the Mayo Medical School. Dr. Christianson resigned from the Mayo Clinic and began a practice in



pediatric anesthesia at Children's Health Care, Minneapolis, and Gillette Children's Specialty Health of St. Paul. He lives in Minneapolis with his wife Kate and their two children.

### **MARGARET ANN CONOVER, M.D.**

Dr. Margaret Ann Conover was born on Sept. 9, 1958, in Galesburg, Indiana. After her undergraduate education from 1976 to 1980 at Creighton University in Omaha, Nebraska, she entered medical school at the same institution. In 1984, she received the M.D. degree from Creighton University. From 1984 to 1987, she was a resident in anesthesiology at the Mayo Graduate School of Medicine. She is certified by the American Board of Anesthesiology. She became an associate consultant in 1987 and a senior associate consultant in 1988 at the Mayo Clinic. She resigned from the Mayo Clinic in 1988. Dr. Conover returned to private practice in Topeka, Kansas, and currently resides in Seattle, Washington.



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### **JAMES P. CONTERATO, M.D.**

Dr. James P. Conterato was born on Aug. 19, 1953, in Illinois. After his undergraduate education at Dartmouth College, Hanover, New Hampshire, from 1971 to 1975, he attended McGill University Medical Center in Montreal (Canada) from 1975 to 1977 and the Rush Medical College in Chicago, Illinois, from 1977 to 1979; he received the M.D. degree in 1979. He served his internship and residency in internal medicine at the Marshfield Clinic in Marshfield, Wisconsin. He then was appointed to the staff in the department of internal medicine at the Marshfield Clinic. In 1983, he resigned from that post and began a residency in anesthesiology at the Mayo Graduate School of Medicine. After his residency at the Mayo Clinic, he was appointed a senior associate consultant in 1987. He was certified by the American Board of Anesthesiology. He



resigned from the Mayo Clinic in 1988. He returned to practice in Marshfield.

### DAVID JAMES COOK, M.D.

Dr. David James Cook was born in South Bend, Indiana, in 1958 and received B. S. degrees in biology and philosophy from Lehigh University, Bethlehem, Pennsylvania. He earned the M. S. degree in philosophy from the University of Tennessee (Knoxville), with a special interest in philosophy of science and was awarded the M.D. degree and elected a member of Alpha Omega Alpha in 1987 from Jefferson Medical College in Philadelphia. Dr. Cook was trained in anesthesiology at the Mayo Clinic, with a subspecialty in cardiothoracic anesthesia. Dr. Cook received research training in cardiac physiology with Dr. Philippe Housmans and in cerebral physiology with Dr. John Michenfelder. Dr. Cook joined the staff in 1992 as a senior associate consultant and was promoted to consultant in 1994. He was certified by the American Board of Anesthesiology. He published the results of clinical and laboratory investigations on cerebral physiology during cardiopulmonary bypass. He is on the editorial board of the journal *Cardiovascular Engineering*.



Dr. Cook was named an associate professor of anesthesiology in the Mayo Medical School in 1999. Dr. Cook is the father of Hannibal and Sheridan Cook and the husband of Pamela.

### RAYMOND FRANK COURTIN, M.D.

Dr. Raymond Frank Courtin was born on June 13, 1912, in Sutton Surrey, England. He attended St. Thomas Hospital Medical School from 1929 to 1935 and received the M. R. C. S. and L. R. C. P. degrees in 1935. After graduation, he was a medical officer in the Royal Air Force. At the end of the World War II (1939-1945), he received the Member of the British Empire (M. B. E.) award from King George VI (1895-1952). From 1947 to 1949, Dr. Courtin was a fellow in anesthesiology at the Mayo Clinic. In 1950, he submitted his M.S. degree thesis, *Electroencephalography During Surgical Anesthesia With Nitrous Oxide, Oxygen, and Ether*. His thesis was the first report on the effects of anesthetic agents on the EEG in humans. Work for the thesis was conducted in collaboration with Drs. Reginald Bickford and Albert Faulconer, Jr. Dr. Courtin was certified by the American Board of Anesthesiology in 1952. He resigned from the Mayo Clinic to become chief of anesthesia at



Baylor Medical Center in Dallas, Texas. With his wife Jean, he organized and directed a pain clinic in Dallas from 1977 until his retirement in 1988.

### **CLAUDIA C. CRAWFORD, M.D.**

Dr. Claudia C. Crawford was born on Mar. 22, 1950, in San Francisco, California. She lived in many parts of the world, growing up in a military and later in a foreign service family. She received the B. A. degree from Michigan State University, Lansing, and worked in pharmacy support and medical-surgical nursing positions at Miami Heart Institute in Miami, Florida, before attending the University of Miami Medical School, from which she received the M.D. degree in 1989. Her residency in anesthesiology was at the University of Miami/Jackson Memorial Hospital. She was certified as an anesthesiologist by the American Board of Anesthesiology in 1994. Dr. Crawford joined the Mayo Clinic Jacksonville, as a senior associate consultant in 1997. She was appointed an instructor of anesthesiology in the Mayo Medical School in 1998. She successfully complet-



ed the examination in perioperative transesophageal echocardiography in 1998.

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### **JOHN DAVID CRECCA, M.D.**

Dr. John David Crecca was born on July 7, 1961, and grew up in Granville, Ohio. He attended college at Ohio Wesleyan University in Delaware, Ohio. He then entered the medical school at Ohio State University in Columbus, Ohio, graduating in 1987. He completed his residencies and fellowship training at Mayo Clinic Rochester. He first completed an internal medicine residency and became board certified in 1990. He then undertook a residency in anesthesiology and became board certified in 1994. Subsequently, he undertook a pain management fellowship and received board certification in this subspecialty. Dr. Crecca was a consultant at the Mayo Clinic Scottsdale from 1993-1994. He resigned and moved to Jackson, Wyoming, to work at St. John's Hospital. He has been married since 1990 to Anne. They and their two children,



Elizabeth and John David, enjoy their family time and the beauty of the American West.

### **ROY F. CUCCHIARA, M.D.**

Dr. Roy Cucchiara was born in 1943 and raised in New Orleans, Louisiana, attended Louisiana State University Medical School, interned at Charity Hospital, New Orleans, and completed a residency in anesthesia and a fellowship in neuroanesthesia at the Mayo Clinic in 1973, at which time he joined the staff as a consultant. He served 2 years in the U. S. Army at the Walter Reed Army Medical Center (Washington, D. C.) and then returned to the Mayo Clinic. He served as an examiner for the American Board of Anesthesiology, published more than 50 original papers, and is a co-editor of *Anesthesia* by R. D. Miller, co-editor of *Anesthesiology Review* by R. Faust, and author of *Clinical Neuroanesthesia*. His national recognition in the field of neuroanesthesia was evidenced by his giving refresher courses of the American Society of Anesthesiologists, invited lectureships, and international seminars. He served as chairman of the Mayo anesthesiology department from 1988 to



1991 and of the anesthesiology department at the University of Florida, Gainesville, from 1993 to 1996. He married Patricia Lovan in 1968, and their son Brett is a neurologist.

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### **LORI A. DANGLER, M.D.**

Dr. Lori Dangler was born on Mar. 19, 1964, in Paulding, Ohio. She attended the Ohio State University in Columbus as an undergraduate student. In 1993, she received the M.D. degree from the Medical College of Georgia in Augusta. She then completed her residency in anesthesiology at the University of Florida, Gainesville, in 1997 and a fellowship in regional anesthesia at the Virginia Mason Clinic in Seattle, Washington. In 1998, Dr. Dangler joined the Mayo Clinic Jacksonville, as a senior associate consultant and was appointed an instructor of anesthesiology in the Mayo School of Medicine.



### **DAVID ROBERT DANIELSON, M.D.**

Dr. David Robert Danielson was born on Feb. 1, 1952, in Chicago, Illinois. In 1977, he received the M.D. degree from the University of Nebraska College of Medicine, Omaha. At Dartmouth Hitchcock (Hanover, New Hampshire), he took two residencies, one in surgery from 1977 to 1979 and the second in anesthesiology from 1979 to 1981. Dr. Danielson was appointed a consultant at the Mayo Clinic in 1981. In 1982, he introduced at the Mayo Clinic the epidural injection of morphine for the treatment of postthoracotomy pain, and in 1984, he introduced the PCA-pump for the treatment of postoperative pain. In 1984, he was certified by the American Board of Anesthesiology, and in 1990, he became head of section and later division chair of multispecialty anesthesia at St. Marys Hospital in Rochester. He and his wife Karen have two children.



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### **EDWARD F. DAW, M.D.**

Dr. Edward F. Daw was born in Des Moines, Iowa, on June 1, 1929. He graduated from the Wentworth Military Academy, Lexington, Missouri, in 1949. Dr. Daw entered the University of Iowa (Iowa City) in 1949 and graduated from the School of Medicine in 1954 with the M.D. degree. Dr. Daw interned at Iowa Methodist Hospital, Des Moines, Iowa, from 1954 to 1955. Dr. Daw entered the U. S. Army in 1955 and was assigned to the Sierra Ordinance Depot, Herlong, California, until 1957. Dr. Daw joined the anesthesia program at Mayo Foundation in 1957 and was appointed an assistant to the staff in 1959 and a consultant in anesthesiology in 1960. Dr. Daw practiced as a neuroanesthesiologist, working with Dr. Howard Terry and Dr. John Michenfelder, conducting studies in neuroanatomy, neuropathology, neurophysiology-EEG, and EMG. He resigned from the Mayo Clinic in 1965. Dr. Daw entered the private practice of anesthesiology in Sioux Falls, South Dakota, in 1965 and practiced at Sioux Valley Hospital (Sioux Falls)



until 1989, at which time he retired to Steamboat Springs, Colorado. Dr. Daw became a Diplomate of the American Board of Anesthesiology in 1962. He and his wife Patricia have six children.

### **BRIAN DAWSON, M.D.**

Dr. Brian Dawson was born on May 16, 1927, in Staplecross, Sussex, England. He received the B.S. degree in 1951 and the M. B. degree in 1954 from University College in London. He served an internship and a residency at University College Hospital, London, from 1954 to 1958. Dr. Dawson entered the Mayo Graduate School of Medicine in 1958. In 1960, he was appointed a consultant. His tenure at the Mayo Clinic was interrupted by private practice at the Surgi Center, Phoenix, Arizona, from 1975 to 1981. In 1981, Dr. Dawson returned to the Mayo Clinic and became associate professor of anesthesiology. He was an enthusiastic and effective teacher of pediatric anesthesia and an early proponent of outpatient surgery and anesthesia. Dr. Dawson was senior examiner for the American Board of Anesthesiology and a strong advocate for residents, students, and all allied health personnel. He was a fellow of the Faculty of Anaesthetists of the Royal College of Surgeons of England and Diplomate of the



American Board of Anesthesiology. Dr. Dawson died on Oct. 31, 1987. He and his wife Sonja, who designed a prototype of the Mayo Clinic logo, had three children.

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### **MARIA ANGELICA deCASTRO, M.D.**

Dr. Maria Angelica deCastro was born on Mar. 25, 1963. She completed a combined B. A. and M.D. program at the University of Missouri, Kansas City, and received the B. A. degree in biology (with distinction) in 1986 and the M.D. degree in 1987. From 1987 to 1988, she interned at the Mayo Graduate School of Medicine and served a residency at the Mayo Clinic from 1988 to 1990. She took subspecialty training in cardiovascular anesthesia at the Mayo Clinic, beginning in 1990. She was appointed a senior associate consultant in 1991 at the Mayo Clinic. She is certified by the American Board of Anesthesiology. She resigned from the Mayo Clinic in 1993 to be associated with the Michael Reese Hospital in Chicago, Illinois, and was appointed an assistant professor of anesthesiology at the University of Illinois, Chicago. Recently, she moved to California and practices at Cedars Sinai Medical Center in Los Angeles.



### **ROXOLANA JOANNE DEMCZUK, M.D.**

Dr. Roxolana Joanne Demczuk was born on Dec. 23, 1951, in Wausau, Wisconsin. Dr. Demczuk completed 4 years of a 5-year program in pharmacy at the University of Wisconsin, Madison. She was accepted into medical school of the University prior to the beginning of the fifth year, before she could obtain a degree in pharmacy. In 1978, she received the M.D. degree from the University of Wisconsin. She served her internship from 1978 to 1979 and a residency in anesthesiology from 1979 to 1981 at the Northwestern Memorial Hospital in Chicago, Illinois. From 1981 to 1982, she was a clinical fellow in anesthesia and then a chief resident in anesthesia. From 1982 to 1985, she was an associate attending staff physician in the department of anesthesiology at Northwestern Memorial Hospital and was an associate in the department of anesthesiology at Northwestern University Medical School, Evanston, Illinois. In 1985, she joined the Olmsted Community Hospital, and in 1986, she became a senior associate consultant in the



department of anesthesiology and an instructor of anesthesiology in the Mayo Medical School. She resigned from the Mayo Clinic. She and her husband, who is a cardiologist, reside in Kansas City.

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### **MARIE L. DeRUYTER, M.D.**

Dr. Marie L. DeRuyter was born on Jan. 5, 1962, in Riverside, California. She attended the University of Santa Clara, California, and received the B. S. degree in biology in 1984. In 1986, she received the M. S. degree in biology from California Polytechnic State University. She attended Creighton University School of Medicine in Omaha, Nebraska, and received the M.D. degree in 1990. Dr. DeRuyter came to the Mayo Clinic Rochester, in 1990. She completed a 1-year internship in internal medicine, after which she entered the residency program in anesthesiology and completed her training in June 1994. Dr. DeRuyter became an associate consultant in the department of anesthesiology at the Mayo Clinic Jacksonville, in July 1994. She was named a senior associate consultant in 1995. She was certified by the American Board of Anesthesiology in 1997 and received the Teacher of the Year Award for the department of anesthesiology in 1996 and 1997. Presently, she is consultant at the Mayo Clinic Jacksonville. She is an instructor of anesthesiology in the Mayo



Medical School and is the program director for the residency program in integrated anesthesia. Dr. DeRuyter is married to Dr. Mark Parkulo, who is a consultant in internal medicine at the Mayo Clinic in Jacksonville. They have two children, Wendy and Daniel.

### **MARTIN L. DeRUYTER, M.D.**

Dr. Martin L. DeRuyter was born on Mar. 20, 1959, in Riverside, California. He received the M.S. degree in biological sciences from the California State Polytechnic University, Pomona, in 1983. He was awarded the M.D. degree from Creighton University School of Medicine, Omaha, Nebraska, in May 1987. In 1987, Dr. De Ruyter came to Rochester, Minnesota, to begin a residency in internal medicine. After completion of this residency in 1990, he began a residency in anesthesiology at the Mayo Graduate School of Medicine. This training was followed by a fellowship in critical care medicine. In 1994, Dr. DeRuyter was appointed a senior associate consultant in the department of anesthesiology. In 1996, he was appointed a consultant in the department of anesthesiology. From 1995 to 1998, he was the co-director of the anesthesiology critical care fellowship, and in 1998, he became program director. In 1999, he was promoted to assistant professor of anesthesiology in the Mayo Medical School. In 1997, he received the distinguished clinician award from the department of



anesthesiology, and in 1998, he was presented with the Karis Award, a Mayo Foundation recognition for his patient care. Dr. DeRuyter is married to Mary DeRuyter, and they have four children.

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### **ROBERT A. DEVLOO, M.D.**

Dr. Robert A. Devloo was born in Ypres, Belgium, on June 21, 1913. He received the M.D. degree from the Catholic University of Louvain, Belgium, in 1938. He entered the Mayo Foundation as a fellow in anesthesiology in 1948. He was a research assistant in the department of anesthesiology at the Massachusetts General Hospital in Boston, Massachusetts, in 1951, and returned to the Mayo Clinic 1 year later. He was appointed a consultant in 1955. Dr. Devloo was certified by the American Board of Anesthesiology in 1956. In 1974, he was appointed an assistant professor of anesthesiology. Dr. Devloo had a special interest in anesthesia for cardiovascular surgery and served in the pioneering group that successfully developed open-heart surgery at the Mayo Clinic. He retired in 1980. Dr. Devloo is married to Ann, a pediatric cardiologist.



### **EDWARD PAUL DIDIER, M.D.**

Dr. Edward Paul Didier was born on May 28, 1925, in Torrington, Connecticut. He received the B. A. degree from Williams College (Williamstown, Massachusetts) in 1946. He served in the U. S. Army Air Force from 1943 to 1945, flying 37 missions in a B-29 bomber in the Pacific Region during World War II (1939-1945). In 1951, he received the M.D. degree from Temple University School of Medicine in Philadelphia. He then interned (1951 to 1952) and served a residency (1952 to 1955) at the Walter Reed Army Hospital in Washington, D. C. He was certified by the American Board of Anesthesiology in 1958. After serving at the U.S.A.F. Hospital in Anchorage, Alaska, he joined the staff of the department of anesthesiology at the Mayo Clinic as a consultant in 1960. He retired from the U. S. Army Reserve with the rank of colonel. Dr. Didier was a member (1978 to 1991) and chairman (1988) of the board of trustees of International Anesthesia Research Society. He served as associate editor of *Anesthesia and Analgesia* for 9 years. From 1972 to 1987, he was the medical director of Mayo-RCC School of Respiratory Therapy; from 1977 to 1983, he was chairman of the respiratory and intensive care section, associ-



ate professor of anesthesiology in the Mayo Medical School; and from 1983 to 1985, he was chairman of the critical care service. On two occasions, once with President Lyndon B. Johnson (1908-1973) and again with President Ronald Reagan (1911- ), Dr. Didier provided anesthesia care for U. S. Presidents. Dr. Didier is married to Lynn. He retired on May 31, 1995.

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### **NIKI M. DIETZ, M.D.**

Dr. Niki M. Dietz was born on Sept. 26, 1961, in Valley City, North Dakota. She received both her undergraduate degrees (chemical engineering and mathematics) and the M.D. degree from the University of North Dakota, Grand Forks. After completing an internship at the University of North Dakota/Meritcare Hospital in Fargo, she came to Rochester for a residency in anesthesiology in 1989. She completed her training in anesthesia in 1993, having finished a clinical subspecialty year in cardiothoracic/vascular anesthesia, followed by a fellowship in clinical neuroanesthesiology. After her clinical training, she received 1 year of research training under the supervision of Dr. Michael Joyner. She spent 3 more years doing research as an N.I.H.-CAP investigator. She was appointed a senior associate consultant in 1994, and 3 years later, she was promoted to the rank of consultant. In 1995, she was appointed an assistant professor of anesthesiology in the Mayo Medical School. Dr. Dietz works in the cardiothoracic/vascular anesthesiology division at St. Marys Hospital, Rochester. In 1996, she was the recipient of the Clinician of the Year Award of the



department of anesthesiology. She continues to pursue research on the broad field of applied physiology and pharmacology of the cardiovascular system in humans. She is committed to resident education and responsible for the scheduling system for all M.D. trainees in the department.

### **GAVIN D. DIVERTIE, M.D.**

Dr. Gavin D. Divertie was born on Dec. 13, 1956, in Rochester, Minnesota. After attending Carleton College in Northfield, Minnesota, he received the M.D. degree from Mayo Medical School in 1983. Dr. Divertie received training in internal medicine, anesthesiology, and endocrinology research at the Mayo Graduate School of Medicine. In 1990, Dr. Divertie was appointed a consultant in anesthesiology at Mayo Clinic in Jacksonville, Florida. He was promoted to an assistant professor of anesthesiology in the Mayo School of Medicine in 1994. Dr. Divertie was the first head of the section of critical care medicine at the Mayo Clinic in Jacksonville. He was certified by the American Board of Internal Medicine in 1987 and by the American Board of Anesthesiology in 1991. He received special qualifications in critical care medicine from the American Board of Internal Medicine and the



American Board of Anesthesiology in 1991. Dr. Divertie and his wife Viky have three children.

### **JERRY A. DORSCH, M.D.**

Dr. Jerry A. Dorsch is a native of Wheeling, West Virginia, and was born on June 24, 1946. He attended Washington and Jefferson College in Washington, Pennsylvania (1963) and West Virginia University Medical School in Morgantown (1967). After his marriage to Susan (Ewing), also an anesthesiologist, he interned in Wheeling, West Virginia (1967-1968) and then undertook an anesthesia residency at the University of Pittsburgh, Pennsylvania (1968-1970) and a fellowship in critical care (1970-1971). It was during the first year of residency that he and Susan decided to write a textbook on anesthesia equipment. After his formal training was completed, he was assigned by the U. S. Navy to Jacksonville, Florida, where he served as a lieutenant commander at the Naval Regional Medical Center (1971-1973). After his discharge from the service, he entered private practice at St. Vincent's Medical Center for the next 14 years. During that time, the first two editions of *Understanding Anesthesia Equipment* were published (1975 and 1984). Subsequently, two more editions of the text were published (1994 and



1999). Dr. James Harper, from the newly established Mayo Clinic, in Jacksonville, Florida, invited Jerry to join the Jacksonville practice. Presently, his practice is primarily devoted to outpatient anesthesia, and he teaches the function of anesthesia equipment.

### **JOHN J. DOYLE, M.D.**

Dr. John J. Doyle is a senior associate consultant at the Mayo Clinic in Jacksonville, Florida.



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### **PHILIPPE A. C. DURANT, M.D., Ph.D.**

Dr. Philippe A. C. Durant was born on Dec. 14, 1951, in Brussels, Belgium. He received the M.D. degree from the Catholic University of Louvain, Belgium, in 1977. His residency and fellowship were at Duke University in Durham, North Carolina, and Mayo Graduate School of Medicine in Rochester, respectively. In 1987, he was awarded the Ph.D. degree in biomedical sciences (pharmacology) by the Mayo Graduate School. In 1988, he began his residency at the Mayo Clinic, and he was appointed a Mayo Scholar from 1988 to 1991 to work in the United Kingdom with Sir James W. Black, the 1988 Nobel Prize winner in physiology and medicine. In 1991, he was appointed a senior associate consultant at the Mayo Clinic. He was certified by the American Board of Anesthesiology in 1994. In 1995, he resigned from the Mayo Clinic to begin private practice of anesthesia in France.



### **BETH A. ELLIOTT, M.D.**

Dr. Beth A. Elliott was born in Greenup County, Kentucky, on May 14, 1956. She attended the University of Louisville School of Medicine in Louisville, Kentucky, and was awarded the M.D. degree in 1981. Dr. Elliott completed her residency in anesthesiology at the Mayo Graduate School of Medicine in 1984, and followed this with a 1-year clinical fellowship in neuroanesthesia and pain management. She was appointed a senior associate consultant in 1985 and a consultant in 1988. Dr. Elliott was promoted to an assistant professor of anesthesiology in the Mayo Medical School in 1988. She pursued her interest in regional anesthesia and pain management by coordinating the early development of the anesthesia pain service at St. Marys Hospital in Rochester from 1986 to 1989. She continued to be involved in the care of patients hospitalized with pain after that time. In 1991, Dr. Elliott began her tenure as medical director of the Mayo Nurse Anesthesia Program. During this period, the program was transformed from a certificate program to one of granting a Master's degree in nurse anesthesia. Dr. Elliott became



chair of the orthopedic anesthesia division at St. Marys Hospital (Rochester) in 1995. She continues to have an interest in regional anesthesia for management of postoperative pain, as well as anesthesia for thoracic and spinal surgery. Dr. Elliott has two children by her first marriage. She married Steven H. Rose, an anesthesiologist at the Mayo Clinic, in 1991.

### **MARK H. ERETH, M.D.**

Dr. Mark Ereth was born in Dickinson, North Dakota, on Mar. 11, 1958. He received the B. S. degree in biology and chemistry with honors from North Dakota College, Jamestown. He received the M.D. degree from the University of North Dakota School of Medicine in Grand Forks in 1985. He then completed a rotating internship at Sioux Valley Hospital in Sioux Falls, South Dakota. He began his training in Rochester (Minnesota) as a resident in the department of anesthesiology in 1986 and completed his residency and a fellowship in cardiovascular and thoracic anesthesia in 1989. He was appointed an instructor of anesthesiology in the Mayo Medical School and a senior associate consultant in 1989. In 1993, he was promoted to consultant and assistant professor. Dr. Ereth has acquired expertise in transfusion, coagulation, and anesthesia for cardiopulmonary bypass. He has served as vice chairman of the Mayo Institutional Review Board as well as co-director of the Mayo



Multidisciplinary Symposium on platelets, blood vessels, and extracorporeal medicine. Dr. Ereth married Karen Hastings in 1985, and they have two children, Michael and Jessica.

## ALBERT FAULCONER, JR., M.D.

Dr. Albert Faulconer, Jr., was born on October 24, 1911, in Arkansas City, Kansas. He received the B.S. and M.D. degrees from the University of Kansas. After an internship at Harper Hospital, Detroit, Michigan (1936 to 1937), he was a resident at MacArthur-Strange Hospital, Mt. Pleasant, Michigan. Dr. Faulconer practiced medicine from 1938 to 1941 and served in the U. S. Army from 1941 to 1945. In 1946, he began his fellowship at the Mayo Clinic. In 1947, he was appointed a consultant, and in 1948, he received the M. S. degree in anesthesiology from the University of Minnesota (Minneapolis). In his thesis, he described the development of an acoustic gas analyzer that allowed the measurement of anesthetic gas concentrations in respired gases. Dr. Faulconer became head of the section of anesthesiology and intravenous therapy in 1953 and chairman of the department of anesthesiology in 1966 at the Mayo Clinic. In 1961, he was promoted to professor of anesthesiology. Beginning in 1964, he served on the board of governors of the Mayo Clinic. Dr. Faulconer had a wide interest in all fields of anesthesiology. He made significant contributions by his studies on the effect of anesthesia



on the EEG and by developing a computer-activated model for the prediction of the uptake and distribution of anesthetics. He published extensively. Dr. Faulconer was president of the American Board of Anesthesiology and the Association of University Anesthesiologists. Dr. Faulconer retired from the Mayo Clinic in December 1971. He was married to Mary Jean and they had three children. Dr. Faulconer died on Dec. 10, 1985.

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## RONALD J. FAUST, M.D.

Dr. Ronald J. Faust, the son of a New Orleans anesthesiologist, was born in 1944. He came to the Mayo Clinic as a resident in anesthesiology in 1973. A veteran of the war in Vietnam (1965-1973), he completed Louisiana State University Medical School in New Orleans with Alpha Omega Alpha honors in 1969 and an internship and 1 year of surgical residency at Charity Hospital in New Orleans. After his anesthesiology residency at the Mayo Clinic, he completed a 6-month fellowship in transfusion medicine. He joined the staff as a consultant in 1976. From the beginning of his career, Dr. Faust dedicated his energy to resident education. He directed the residency program in anesthesiology for 15 years. During this period, 248 residents and fellows trained at the Mayo Clinic and the program grew from 26 to 62 positions. At the national level, he helped found the Society for Education in Anesthesia to aid anesthesiologists in learning better ways to teach; he served as president of that group during 1991 and 1992. In 1991, he also published the first edition of *Anesthesiology Review*, a textbook whose goal is to help residents prepare for board certification examinations. Second and third editions were prepared during the next decade. The text was more popular than expected, the first and sec-



ond editions selling more than 27,000 copies. Through the text, Dr. Faust and his associate editors mentored many Mayo Clinic staff and residents in their medical writing skills and gave them opportunities to publish early in their academic careers. He was promoted to professor of anesthesiology in the Mayo Medical School in 1995. He and his wife Claire have two daughters and one son. In addition to anesthesia education, his interests include transfusion medicine.

### **NEIL G. FEINGLASS, M.D.**

Dr. Neil G. Feinglass was born in Miami, Florida, on July 20, 1957. He received the M.D. from Vanderbilt University in Nashville, Tennessee, in 1983. Dr. Feinglass completed his internship and residency under the supervision of Dr. Jerome Modell at the University of Florida (Gainesville). He remained at Gainesville for a fellowship in critical care medicine and completed his cardiac training at the Texas Heart Institute with Dr. Arthur Keats. In 1987, Dr. Feinglass was appointed a senior associate consultant at the Mayo Clinic in the department of anesthesia. Dr. Feinglass elected to transfer to the Mayo Clinic in Jacksonville in 1988. In 1990, Dr. Feinglass was appointed an instructor of anesthesiology in the Mayo Medical School and a consultant in the Mayo Clinic. He became a founding member in the critical care service and was promoted to assistant professor of anesthesiology in 1993. Dr. Feinglass initiated the intraoperative cardiac echocardiography services at the Mayo Clinic in Jacksonville and became head



of section of cardiac anesthesia in 1998. In 1998, Dr. Feinglass became one of the first board-certified echocardiographer anesthesiologists in the United States.

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### **JAMES Y. FINDLAY, M.D.**

Dr. James Y. Findlay was born in Cullen, Scotland, in 1962. He graduated from the University of Edinburgh, receiving the B. Sc. degree with first class honors in biochemistry (1984) and the M. B. Ch. B. degree (1986). He trained in anesthesiology in Glasgow, Scotland, and Perth, Australia, and was elected as a fellow of the Royal College of Anaesthetists (London) in 1990. He completed fellowships at the Mayo Clinic, Rochester, in intensive care/anesthesiology in 1994, and in transplantation anesthesiology in 1996. He was appointed a senior associate consultant at the Mayo Clinic, Rochester, in 1997. His interests are liver transplantation anesthesiology and critical care. He is married to Dr. Aleta Borrud, a staff physician in general internal medicine. They have two children, Hannah and Alex.



### **JERRY E. FLEISCHER, M.D.**

Dr. Jerry E. Fleischer was born on Sept. 30, 1956, and raised in Los Angeles, California. He received the B. S. degree in bioengineering from the University of California, San Diego, in 1978 and the M.D. degree from the University of Texas Medical Branch, Galveston, Texas, in 1982. Dr. Fleischer completed a rotating internship at San Francisco General Hospital. He returned to the University of California, San Diego, for residency training in anesthesiology. Dr. Fleischer came to the Mayo Graduate School of Medicine in 1985 as a fellow in neuroanesthesiology. In July 1986, he was appointed an instructor of anesthesiology in the Mayo School of Medicine. In 1987, he returned to the University of California, San Diego, as an assistant clinical professor of anesthesiology. In 1990, Dr. Fleischer left academic medicine for private practice in anesthesiology. He is a member of Anesthesia Associates of New Mexico, a group of 45 anesthesiologists practicing



in Albuquerque and Santa Fe, New Mexico. Dr. Fleischer and his wife Connie live in Albuquerque, New Mexico, with their three children.

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### **RANDALL P. FLICK, M.D.**

Dr. Randall P. Flick was born on June 24, 1957, in Fargo, North Dakota. He obtained the R. N. degree from St. Luke's Hospital School of Nursing. He earned the B. A. degree in biology from Moorhead State University, Moorhead, Minnesota, and the M.D. degree from the University of North Dakota School of Medicine, Grand Forks. After a pediatric internship at St. Louis Children's Hospital, Washington University Medical Center, St. Louis, Missouri, he served a residency in pediatrics at the same institution. In 1990, he began his residency in anesthesiology at Barnes Hospital, Washington University Medical Center, St. Louis, and then took special training in pediatric intensive care and pediatric anesthesiology from 1992 to 1995 at the Johns Hopkins Hospital, Baltimore, Maryland, and in 1994, received the M. P. H. degree. In 1995, Dr. Flick was appointed a senior



associate consultant at the Mayo Clinic, Rochester.

### **PETER E. FRASCO, M.D.**

Dr. Peter E. Frasco was born in Suffern, New York, on April 3, 1961. He attended Georgetown University, earning the B. S. degree in 1983. He remained at Georgetown University for his medical education and graduated in 1987, after election to Alpha Omega Alpha Honor Society. He used the U. S. A. F. Health Profession Scholarship Program to help pay for his medical education, and it was during a summer externship in the anesthesiology department at Wilford Hall U. S. A. F. Medical Center that he was drawn to the specialty. He enjoyed his experience with the air force so much that he elected to forego the "civilian match" to enter the residency program in anesthesiology at Wilford Hall. He decided to pursue a fellowship in cardiac anesthesiology. He left Wilford Hall in 1990, began a 2-year fellowship at Duke University in Durham, North Carolina, after which he returned to Wilford Hall as chief of the cardiac anesthesia group. He remained there until 1994, when the air force offered him a position as chief of the department at the 48th Medical Group of the Royal Air Force in Lakenheath, Suffolk, in the United Kingdom. He spent 2 years overseas. He participated in department of defense missions to Kazakhstan,



Turkey, Italy, and Germany. It was during his time in England that he met and married Toni Suzanne Betts. They returned to the United States in 1996 and spent 2 years at Keesler Medical Center in Biloxi, Mississippi. Peter was appointed a senior associate consultant at the Mayo Clinic Scottsdale, Arizona, in March 1999. He and his wife have one son.

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### **EDWARD D. FRIE, M.D.**

Dr. Edward D. Frie was born in St. Cloud, Minnesota, on July 11, 1951. He served in the U.S. Marine Corps as a paratrooper from 1969 to 1973. He returned to Minnesota to attend schools in both nursing and nurse anesthesia. He worked as a nurse anesthetist for 10 years before he returned to academics to prepare for medical school. He received the M.D. degree from the Medical College of Wisconsin, Milwaukee, in 1993. He came to Rochester and completed a residency in anesthesiology at the Mayo Graduate School of Medicine in 1997. He was certified by the American Board of Anesthesiology in 1999. Upon completion of his residency, Dr. Frie was appointed a senior associate consultant. He established the Mayo Clinic's first off-site anesthesia practice at Austin Medical Center, Austin, Minnesota. He also is in the practice of anesthesia in Rochester, at Methodist and at St. Marys hospitals. At both Rochester and Austin sites, he



is active in the education of anesthesia residents and nurse anesthetists. He and his wife Nancy have a son, Robert.

### **ROBERT J. FRIEDHOFF, M.D.**

Dr. Robert J. Friedhoff was born on June 29, 1953, in Detroit, Michigan. He received the M.D. degree in 1986 from the Wayne State University School of Medicine in Detroit. Dr. Friedhoff was an anesthesiology resident at Mayo Graduate School of Medicine from 1987 to 1990. His residency included a Mayo Foundation Scholarship in pediatric anesthesia at the Children's National Medical Center in Washington, D. C. In May 1990, he was appointed a senior associate consultant at the Mayo Clinic, Rochester, and an instructor of anesthesiology in the Mayo Medical School in 1992. In 1993, he became a consultant and was promoted to section head of pediatric anesthesia and medical director of the PACU in 1996. Dr. Friedhoff was certified by the American Board of Anesthesiology in 1992. He is program director for the Minnesota Society of Anesthesiologists. Dr. Friedhoff and his wife Theresa have one daughter.



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### **GLENN A. FROMME, M.D.**

Dr. Glenn A. Fromme was born on Oct. 28, 1950, in Cincinnati, Ohio. He attended Loyola University in Chicago, Illinois, from 1968 through 1972 and received the B. S. degree in biology. He entered the University of Wisconsin Medical School in Madison, Wisconsin, in 1972, receiving the M.D. degree in 1976. He served his internship and residency in anesthesiology at the Mayo Graduate School of Medicine from 1976 through 1979. In 1979, he was appointed a consultant at the Mayo Clinic, Rochester. Dr. Fromme was certified by the American Board of Anesthesiology in 1981. He resigned from the Mayo Clinic staff in 1990 to enter private practice in Springfield, Missouri, and he continues to practice there. He and his wife Mona have three children.



### **BHARGAVI GALI, M.D.**

Dr. Bhargavi Gali was born on Mar. 4, 1967, in Guntur, Andhra Pradesh, India. With her family, she immigrated to the United States when she was 4 years old. She attended the University of Michigan Medical School (Ann Arbor) and received the M.D. degree in 1992. She then served an internship at St. Joseph's Hospital in Ann Arbor and completed her residency and a critical care fellowship at the University of Pittsburgh (Pennsylvania). She worked briefly at the University of Maryland (Baltimore) before coming to Rochester, Minnesota, as a senior associate consultant in 1999. She and her husband Deepi, an emergency medicine physician at the Mayo Clinic, have two children.



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### **ROBERT C. GARRISON, M.D.**

Dr. Robert C. Garrison was born on Jan. 13, 1933, in Birmingham, Alabama. After graduation from Davidson College (Davidson, North Carolina) in 1954, he received the M.D. degree from the University of Alabama School of Medicine (Birmingham) in 1958. He served with the U. S. Navy from 1959 to 1967, completing his residency in anesthesia at the Bethesda Naval Hospital (Maryland) in 1963. While there, he participated in the care of President Lyndon Johnson (1908-1973) during his two surgical procedures and of Vice President Hubert Humphrey (1911-1978). In 1967, he was appointed a consultant at the Mayo Clinic, Rochester. In 1969, he began a solo private practice of anesthesia in Anderson, South Carolina. Currently, he is director of anesthesia services at an ambulatory surgery center in Anderson, with primary emphasis in cosmetic and reconstructive plastic surgery. Since 1966, he has been a Diplomate of the American Board of Anesthesiology. Dr. Garrison



and Jane, his wife of 45 years, currently reside in Highlands, North Carolina, where their five children and seven grandchildren are frequent visitors.

### **SALIM M. GHAZI, M.D.**

Dr. Salim M. Ghazi was born in Lebanon on Aug. 12, 1962. He attended St. Joseph French University in Beirut, Lebanon, where he obtained the M.D. degree in 1986. In 1987, he was a resident in internal medicine at Robert Wood Johnson University Hospital in New Brunswick, New Jersey. Upon completion of his residency in 1990, Dr. Ghazi began a residency in anesthesiology at Duke University Medical Center (Durham, North Carolina). He also completed a fellowship in pain management at Durham-V. A. Hospital and was on staff in the department of anesthesiology at Duke University for 6 months. Dr. Ghazi joined the Mayo Clinic Jacksonville in 1997 as a senior associate consultant, after having been in private practice for 3 years. Dr. Ghazi was board certified in internal medicine in 1990 and in anesthesiology in 1994. He was also certified by the American Board of Pain Medicine in 1997 and obtained his subspecialty certification in pain management from the American Board of



Anesthesiology in 1998. He is an expert in the field of interventional pain management and anesthesiology for organ transplantation. Dr. Ghazi resides in Ponte Vedra Beach, Florida.

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### **ALLAN B. GOULD, M.D.**

Dr. Allan B. Gould was born in Buffalo, New York, on Dec. 31, 1928. He attended Ohio State University in Columbus, Ohio, and received the M.D. degree from Jefferson Medical College of Philadelphia (Pennsylvania). After interning at Philadelphia General Hospital, he entered a fellowship program in anesthesiology at the Mayo Clinic. His program was interrupted by 2 years in the U. S. Army, serving in Korea in a Mobile Army Surgical Hospital unit. He received the M.S. degree from the University of Minnesota (Minneapolis) and joined the Mayo Clinic as a consultant in 1958, serving as section head at the Methodist Hospital from 1972 to 1980. Dr. Gould was certified by the American Board of Anesthesiology and served as an associate examiner at their oral examinations. He was a member of the board of directors of the American Society of Anesthesiologists (ASA), served as chairman of the annual meeting committee on two occasions, and edited the ASA newsletter



from 1968 to 1973. He was chairman of the Anesthesia Committee of the Minnesota State Medical Association. Dr. Gould retired in 1991. He and his wife Marilyn have five children.

### **ROBERT E. GRADY, M.D.**

Dr. Robert E. Grady was born on May 9, 1965, in Lompoc, California. He attended Wake Forest University in Winston-Salem, North Carolina, where he obtained the B. S. degree in 1987. He studied medicine at the Bowman Gray School of Medicine, Wake Forest University, where he obtained the M.D. degree in 1991. In 1991, Dr. Grady served a 1-year internship at Mercy Hospital of Pittsburgh (Pennsylvania). After completing his residency in anesthesiology at the Western Pennsylvania Hospital (Pittsburgh) in 1995, he entered the Mayo Graduate School of Medicine and completed a 1-year fellowship in neuroanesthesiology. He became an instructor of anesthesiology in the Mayo Medical School and a senior associate consultant in 1996 and was promoted to consultant and assistant professor of anesthesiology in 1999. Dr. Grady was certified



by the American Board of Anesthesiology in 1997. Dr. Grady is married and has two children.

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### **JOHN R. GRAY, M.D.**

Dr. John R. Gray was born on Aug. 27, 1947, in Duluth, Minnesota. He received the M.D. degree in 1980 from the Mayo Medical School (Rochester). In June 1983, he completed a residency in anesthesiology at the Mayo Graduate School of Medicine. He then joined the staff of the Mayo Clinic as a consultant in anesthesiology. Dr. Gray resigned his staff appointment in 1985 to enter the private practice of anesthesiology. He was certified by the American Board of Anesthesiology in 1987. Dr. Gray and his wife Sharon currently reside in Duluth, Minnesota.



### **ERIC JEROME GRIGSBY, M.D.**

Dr. Eric Jerome Grigsby was born on Oct. 17, 1957, in Knoxville, Tennessee. He received his undergraduate education from Brown University in Providence, Rhode Island, from 1975 to 1979, when he graduated with the B. A. degree. He then attended Boston University School of Medicine (Boston, Massachusetts) from 1980 to 1984, when he received the M.D. degree. He entered the Mayo Graduate School of Medicine as a resident in general surgery in 1984. In 1986, he became a resident in anesthesiology at the Mayo Clinic in Rochester. In 1988, he was appointed a senior associate consultant and an instructor of anesthesiology in the Mayo Medical School. He is certified by the American Board of Anesthesiology. He resigned from the Mayo Clinic in 1994. He and his wife Mary Frances, who is a dentist, reside in Napa, California.



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### **NANCY NEHER GRINTON, M.D.**

Dr. Nancy Neher Grinton was born on Sept. 18, 1951, in Baton Rouge, Louisiana. In 1973, she graduated from Purdue University (Lafayette, Indiana) with the B. S. degree. She received the M. S. degree in 1976 and the M.D. degree from the Louisiana State University in Baton Rouge in 1979. She served a flexible internship at Earl K. Long Memorial Hospital in Baton Rouge, and from 1981 to 1983, she was a resident at the Alton Ochsner Medical Foundation in New Orleans. She was an assistant professor of anesthesiology at the Tulane Medical Center and a consultant in anesthesiology at Charity Hospital and Veterans Administration Hospital in New Orleans from 1983 to 1984. In 1984, she entered the Mayo Graduate School of Medicine as a clinical fellow in neuroanesthesia. In 1985, she was appointed a senior associate consultant at the



Mayo Clinic. She is certified by the American Board of Anesthesiology. She resigned from the Mayo Clinic in 1987.

### **GERALD A. GRONERT, M.D.**

Dr. Gerald A. Gronert was born in Chicago, Illinois, on Sept. 17, 1933. He received the M.D. degree from the University of Illinois (Chicago) in 1958. After an internship at St. Louis City Hospital (Missouri) from 1958 to 1959, he was a resident at the University of Colorado (Denver) from 1959 to 1961. He then practiced in Denver from 1961 to 1966. In 1966, Dr. Gronert joined the Mayo Clinic staff as a consultant in the department of anesthesiology. His tenure at the Mayo Clinic was interrupted by service in the U. S. Army from 1967 to 1969. At the Mayo Clinic, he worked for 20 years in neuroanesthesia with Dr. John Michenfelder as his mentor. Dr. Kai Rehder introduced him to the problems of malignant hyperthermia, a field in which Dr. Gronert became an internationally known expert. Prior to his work on malignant hyperthermia, he was involved in research of hyperkalemia under the guidance of Dr. Richard Theye. In 1986, Dr. Gronert resigned from the Mayo Clinic to join the



University of California, Davis. He retired in November 1998. Dr. Gronert and his wife Pat have four children and currently reside in Albuquerque, New Mexico.

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### **SUSAN GARDNER HAGSTROM, M.D.**

Dr. Susan Gardner Hagstrom was born in 1962 and was raised in Southern California. After her undergraduate education at Dartmouth College (Hanover, New Hampshire), she attended Dartmouth Medical School (Hanover). She then began a residency in internal medicine at the Mayo Graduate School of Medicine. She joined the Mayo Clinic as a senior associate consultant in the department of anesthesiology in Scottsdale (Arizona) and is an instructor of anesthesiology in the Mayo School of Medicine. Currently, she is the director of the preoperative medical clinic at the Mayo Clinic in Scottsdale.



### **BRIAN A. HALL, M.D.**

Dr. Brian A. Hall was born in 1956 and was reared in Colorado and completed undergraduate studies at the University of Colorado in Boulder. He attended medical school at the University of Colorado Health Sciences Center in Denver, graduated in 1986, and served as an intern at Presbyterian and St. Luke's hospitals in Denver, Colorado. In 1987, Dr. Hall came to the Mayo Clinic for a residency in anesthesiology, which he completed in 1990. He was appointed a senior associate consultant in 1990 and was promoted to a consultant in 1993. In 1996, he became assistant professor of anesthesiology in the Mayo School of Medicine. In 1992, he and Dr. Keith A. Jones published a book in anesthesiology entitled, *Anesthesia: A Comprehensive Review*. A second edition was published in 1997, and a third edition is anticipated. Dr. Hall has served on the liver transplant team since 1991 and has worked in the multispecialty division in anesthesiology at St. Marys Hospital in Rochester. He has also



been responsible for developing and managing the centralized scheduling system that has been in use in the department of anesthesiology at the Mayo Clinic since 1997.

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### **JERRY A. HALL, M.D.**

Dr. Jerry A. Hall was born in 1963. He completed his anesthesiology residency at the Mayo Clinic. In 1996, he joined the staff of the Mayo Clinic Jacksonville after leaving the University of Virginia in Charlottesville. His main interest was pain management. Dr. Hall resigned from the Mayo Clinic in 1999 to enter private practice in Kansas City, Missouri.



### **JAMES D. HANNON, M.D.**

Dr. James D. Hannon was born in St. Paul, Minnesota, on June 29, 1958. He received the M.D. degree from the Mayo Medical School (Rochester, Minnesota) in 1984. He completed a residency in internal medicine at the Mayo Clinic in 1987 and a research fellowship in pharmacology in Dr. John Blinks' laboratory in 1990. He was a senior research fellow in physiology and biophysics at the University of Washington, Seattle, until 1992, working with Dr. Albert Gordon. In June 1992, Dr. Hannon began a residency in anesthesiology at the Mayo Clinic and was appointed a senior associate consultant in 1995. In 1998, he was appointed a consultant. Dr. Hannon was appointed an instructor in anesthesiology in 1994 and was promoted to an assistant professor of anesthesiology in the Mayo Medical School in 1996. He was certified by the American



Board of Medicine in 1987 and by the American Board of Anesthesiology in 1996.

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### **JAMES V. HARPER, M.D.**

Dr. James V. Harper was born on Sept. 25, 1948, in Burbank, California. From 1967 to 1970, he served in the U. S. Army, Special Forces. He then attended Golden West College (Huntington Beach, California) and Northern Arizona University and graduated in 1975 with the B. S. degree. From 1975 to 1978, he studied medicine at the University of Arizona College of Medicine (Tucson) and received the M.D. degree in 1978. He served a straight surgical internship at the Mayo Clinic from 1978 to 1979 and a residency in anesthesiology at the Arizona Health Sciences Center from 1980 to 1982. In 1982, Dr. Harper was appointed a consultant at the Mayo Clinic. Dr. Harper was certified by the American Board of Anesthesiology in 1984. Dr. Harper was named chairman of the department of anesthesiology at the Mayo Clinic Jacksonville, in 1988. He resigned from the Mayo Clinic in 1996.



### **BARRY A. HARRISON, M.D.**

Dr. Barry A. Harrison was born on Aug. 20, 1952, in Melbourne, Australia. He attended the Faculty of Medicine, Monash University in Victoria, Australia, and received the M. B. B. S. degree in 1975. He completed a fellowship in critical care at the Mayo Clinic in Rochester in 1988 and was appointed a consultant in 1991. In 1997, he was appointed an assistant professor of anesthesiology in the Mayo School of Medicine. Dr. Harrison was certified by the American Board of Anesthesiology in 1992 and received the certificate of special qualifications in critical care by the American Board of Anesthesiology in 1993.



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### **VIRGINIA B. HARTRIDGE, M.D.**

Dr. Virginia B. Hartridge was born on Mar. 29, 1919, in Milwaukee, Wisconsin. She received the B. A. degree from Milwaukee-Downer College, the M. S. P. H. degree from the University of Michigan (Ann Arbor), and the M.D. degree from Woman's Medical College, Philadelphia, Pennsylvania (1950). After receiving the M.D. degree, she completed an internship at Woman's Medical College Hospital. She served in the U. S. Army from 1942 to 1950 and was on active duty in the U. S. Navy from 1950 to 1953. Dr. Hartridge joined the Mayo Clinic as a fellow in anesthesiology in 1953 and was appointed a consultant in 1956. She was certified by the American Board of Anesthesiology in 1960. Dr. Hartridge served in the Mayo Clinic School of Nurse Anesthetist as education director from 1956 to 1964 and medical director from 1965 to 1974. In 1980, she was promoted to an associate professor of anesthesiology in the Mayo Medical School. Dr. Hartridge is a fellow of the American



College of Anesthesiologists and a trustee of Lawrence University in Appleton, Wisconsin. Dr. Hartridge retired from the Mayo Clinic in April 1982.

### **JAMES R. HEBL, M.D.**

Dr. James R. Hebl was born on Jan. 1, 1969, in Mankato, Minnesota. He attended Saint John's University in Collegeville, Minnesota, from 1987 to 1991, graduating summa cum laude with the B. S. degree in the biological sciences. He received the M.D. degree from the University of Minnesota (Minneapolis) in 1995 and completed his internship in preliminary internal medicine at the Mayo Graduate School of Medicine in 1996. Dr. Hebl served his residency in anesthesiology at the Mayo Clinic. During his residency, Dr. Hebl was president of the Minnesota Society of Anesthesiologists Resident Component and served as a delegate to the American Society of Anesthesiologists Resident House of Delegates. In 1999, Dr. Hebl was appointed a senior associate consultant and an instructor of anesthesiology in the Mayo School of Medicine. He will complete his formal training as a National Institutes of Health (N.I.H.) clinical research fellow in 2000. His research interests focus on the safety and



efficacy of regional anesthetic techniques, and on their perioperative utilization for acute pain management. Dr. Hebl and his wife Heather currently reside in Rochester with their two sons.

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### **FREDERIC H. HELMHOLZ, JR., M.D.**

Dr. Frederic H. Helmholz, Jr., was born in 1911, in Chicago, Illinois. He attended the Johns Hopkins University School of Medicine (Baltimore, Maryland), graduating in 1937. After a medical internship at the Massachusetts General Hospital (Boston) and a fellowship in physiology at the Mayo Graduate School of Medicine (Rochester, Minnesota), from 1942 to 1946, he worked as a flight physiologist for the Consolidated Vultee Aircraft Corporation in San Diego, California, and worked part time as a member of the Mayo Aeromedical Unit. In 1947, he joined the department of physiology of the Mayo Clinic as a consultant. His research interests are circulatory and respiratory physiology. From 1943 to 1967, he was in charge of the basal metabolism laboratory and of inhalation therapy. Dr. Helmholz retired in 1976 as an associate pro-



fessor of physiology in the Graduate School of the University of Minnesota (Minneapolis).

### **ISABELLA COLER HERB, M.D.**

Dr. Isabella Coler Herb was born in November 1863 or 1864 (date is uncertain) in Clyman, Wisconsin. She received the M.D. degree from Northwestern University Woman's Medical School in Chicago (Illinois). After graduation, she served an internship at Mary Thompson Hospital for Women and Children in Chicago and was an assistant to the medical staff until 1894. She became a dispensary physician and superintendent at the same faculty. This experience was followed by a 3-year period as anesthetist and pathologist at Augustana Hospital in Chicago, where she worked with Dr. Lawrence Prince, an expert in open-drop anesthesia. In November 1899, she joined the medical staff of the Mayo Clinic, where she worked both as an anesthetist for Dr. Charlie Mayo and as the pathologist. She was the first "physician anesthetist" at the Mayo Clinic. In 1904, Dr. Herb resigned from the Mayo Clinic to perform research in bacteriology at Rush Medical College (Chicago, Illinois). From 1909, she was the chief anesthetist at Presbyterian Hospital and Rush Medical College.



On Mar. 23, 1923, she introduced the use of ethylene into clinical anesthesia. Dr. Herb retired on June 7, 1941, as professor of surgery (anesthesia) at Rush Medical College. She died on May 28, 1943.

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### **TODD MICHAEL HESS, M.D.**

Dr. Todd Michael Hess was born on Jan. 8, 1960. In 1978, he matriculated at St. John's University and earned the B. S. degree, magna cum laude, in 1982. He then attended the University of Minnesota in Duluth for 2 years and thereafter the University of Minnesota Medical School (Minneapolis). In 1986, he received the M.D. degree and then entered the Mayo Graduate School of Medicine as a resident in anesthesiology. In 1990, he was appointed a senior associate consultant. He is certified by the American Board of Anesthesiology. He resigned from the Mayo Clinic in 1990.



### **ROGER E. HOFER, M.D.**

Dr. Roger E. Hofer was born on Jan. 3, 1957 in Huron, South Dakota. He received the B. S. degree from South Dakota State University (Brookings) in 1979. He received the M. S. degree in neurophysiology in 1981 and the M.D. degree in 1986 from the University of South Dakota (Vermillion). Dr. Hofer completed a 12-month internship in surgery and subsequently completed a residency in anesthesiology and a fellowship in neuroanesthesia in the Mayo Graduate School of Medicine. In 1990, Dr. Hofer was appointed an associate consultant while continuing his research in neuroanesthesia. In 1991, he was appointed a senior associate consultant and was promoted to consultant in 1994. Dr. Hofer was promoted to assistant professor in the Mayo Medical School in 1994. Dr. Hofer and his wife Celeste have four children.



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### **TERESE T. HORLOCKER, M.D.**

Dr. Terese T. Horlocker was born in Rochester, Minnesota, on Apr. 2, 1959. She received the M.D. degree in 1985 from Mayo Medical School and completed her residency in anesthesiology at the Mayo Graduate School of Medicine. Dr. Horlocker was appointed an instructor of anesthesiology in the Mayo Medical School in 1989 and was promoted to assistant professor in 1993 and to associate professor in 1997. Dr. Horlocker is recognized for her contributions to regional and orthopedic anesthesia. She is an editor of *Regional Anesthesia and Pain Medicine*, a member of the board of directors of the American Society of Regional Anesthesia, and the chair of the Food and Drug Administration Advisory Committee on Anesthetic and Life Support Drugs. Dr. Horlocker is head of the section of orthopedic anesthesiology at the Mayo Clinic.



### **PHILIPPE ROBERT HOUSMANS, M.D., Ph.D.**

Dr. Philippe Robert Housmans was born on Aug. 27, 1953, in Oostende, Belgium. He received the M.D. degree from the University of Antwerp, Belgium, in 1978. After 3 years of residency in anesthesiology and critical care medicine at the University of Antwerp, he became a resident in anesthesiology, serving from 1981 to 1983. In 1982, he was a Fogarty International Research Fellow (N. I. H.) working with Dr. John R. Blinks. From 1983 to 1984, he was a principal investigator (National Research Council, Belgium) in physiology and a consultant in anesthesiology at the University of Antwerp. He joined the staff of the Mayo Clinic in 1984 as a special clinic fellow. He was certified by the American Board of Anesthesiology in 1987. From 1985 to 1987, he was a Rappaport Scholar. He was promoted to associate professor of anesthesiology and pharmacology in the Mayo Medical School in 1992. In 1994, he left the Mayo Clinic to become vice-chair of anesthesiology at the OLV Hospital in Aalst, Belgium, a position he held for 2 years. In January 1997, he rejoined the staff in anesthesiology at the Mayo Clinic as a senior associate consultant and reestablished the research program in cardiac muscle physiology and pharmacology. Dr. Housmans has trained with Dr. Dirk L. Brutsaert (University of Antwerp) in physiology



and with Dr. John R. Blinks (Mayo Clinic) in pharmacology. He is recognized for his work on the effects of anesthetics on the myocardium. He served as a reviewer on the surgery-anesthesiology-trauma study section of the N. I. H. and on the cellular physiology section of the National Science Foundation. He served on the editorial boards of the *American Journal of Physiology* and the *Journal of Cardiovascular Pharmacology*. Dr. Housmans is married to Isabelle Nedee. They have two children, Nicholas and Stephanie.

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### **CHRISTOPHER F. JAMES, M.D.**

Dr. Christopher F. James was born on Oct. 2, 1950, in Washington, D. C. He received the M.D. degree in 1977 from the University of Maryland School of Medicine in Baltimore. After completing a residency in anesthesiology and a fellowship in obstetric anesthesiology at the University of Florida College of Medicine (Gainesville), he joined the staff at the University of Florida in the department of anesthesiology in 1982. At the University of Florida, Dr. James received the outstanding teacher award in 1983 and in 1984 and was the author of many publications. He was promoted to associate professor of anesthesiology in 1991. Dr. James served in the U. S. Navy Reserves from 1987 to 1997, where he rose to the rank of commander and served at the National Naval Medical Center in Bethesda, Maryland, during Operation Desert Storm in 1991. Dr. James joined the Mayo Clinic Jacksonville, in 1997 as director of obstetrical anesthesia. He began a rotation for residents in anesthesia in obstetric anesthesia. This has been approved for accreditation as a fellowship in obstetric anesthesia. Dr. James was certified by



the American Board of Anesthesiology in 1982. He serves on two obstetric anesthesia subcommittees of the American Society of Anesthesiology, is active in the Society of Obstetric Anesthesiology and Perinatology, and has served on a task force with the Florida Society of Anesthesiologists. He has four children.

### **CHRISTOPHER J. JANKOWSKI, M.D.**

Dr. Christopher J. Jankowski was born in Milwaukee, Wisconsin, on Dec. 6, 1961. He graduated from Lawrence University in Appleton, Wisconsin, in 1984. He received the M.D. degree from the University of Rochester, Rochester, New York, in 1993. Dr. Jankowski entered the Mayo Graduate School of Medicine as a resident in internal medicine. In 1994, prior to entering a residency in anesthesiology, he joined the laboratory of Drs. David O. Warner and Keith A. Jones and completed a 1-year research fellowship. In 1997, he was appointed a chief resident in anesthesiology. He was appointed a senior associate consultant in December, 1997. In 1999, he was certified by the American Board of Anesthesiology. He is married to Janine Yanisch.

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### **THEODORE A. JANOSSY, M.D.**

Dr. Theodore A. Janossy was born in Los Angeles, California, in May 1949. He has been certified by the American Board of Anesthesiology and the American College of Anesthesiology. Dr. Janossy was a consultant at the Mayo Clinic, Rochester, from 1978 to 1981, and again, from 1982 through 1989. In 1990, he entered private practice in Minneapolis, Minnesota.



### **MICHAEL E. JOHNSON, M.D., Ph.D.**

Dr. Michael Johnson was born on Sept. 11, 1953, in Mesa, Arizona. He received the B. S. degree from Brigham Young University, Provo, Utah, in 1977, summa cum laude and with highest honors, and the M.D. and Ph. D. degrees from Duke University, Durham, North Carolina, in 1986. He served an internship and a residency at the Mayo Graduate School of Medicine from 1986 to 1989. He was appointed a senior associate consultant (1990) and a consultant (1993) at the Mayo Clinic. In 1991, he was certified by the American Board of Anesthesiology and was appointed an assistant professor of anesthesiology in the Mayo Medical School in 1995. His research interests concern the mechanisms of cell death from hypoxia and other insults that can accompany anesthesia, and the effect of anesthetic interventions on cell death. He and his wife Wendy have five children.

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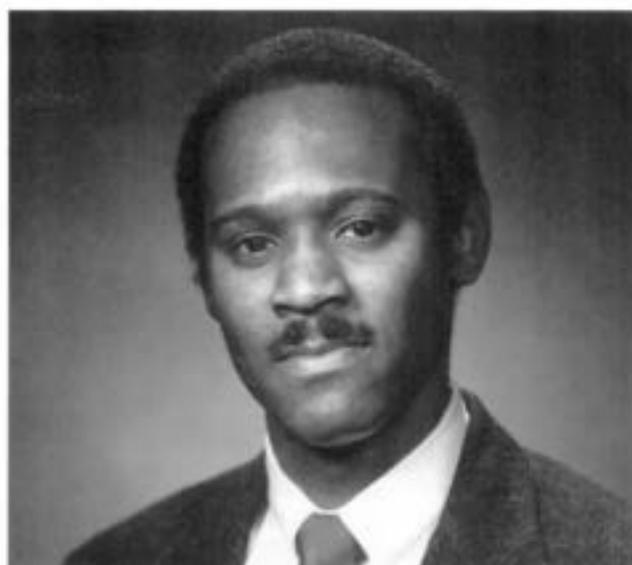
### **SHARON R. JOHNSTON, M.D.**

Dr. Sharon R. Johnston was born on Dec. 3, 1959, in Michigan. She joined the staff of the Mayo Clinic in Scottsdale in 1990 as a senior associate consultant. She is certified by the American Board of Anesthesiology. She resigned from the Mayo Clinic in 1992.



### **KEITH A. JONES, M.D.**

Dr. Keith A. Jones was born on Sept. 2, 1960, in Fort McClellan, Anniston, Alabama. Dr. Jones received the M.D. degree from the University of Alabama, Birmingham, in 1982. Dr. Jones began his career at the Mayo Graduate School of Medicine as a fellow in anesthesiology in 1982. After completing his residency, he pursued research training with Dr. Kai Rehder in the physiology of smooth muscle. He was appointed an instructor in the Mayo Medical School and subsequently was promoted to assistant professor in 1993 and to associate professor of anesthesiology in 1998. Dr. Jones was certified by the American Board of Anesthesiology in 1991. He practices in the multispecialty and neuroanesthesia divisions and provides anesthesia for the orthotopic liver transplantation program. His contribution to resident education includes a best-selling board review book entitled *Anesthesia: A Comprehensive Review*. Dr. Jones is best known for his work on the physiology of smooth muscle, with emphasis on mechanisms



responsible for smooth muscle hypersensitivity and asthma. In 1999, he was appointed an associate editor of the *Journal of Applied Physiology*. He was married in 1985 to Evelyn Seldon, and they have two children

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### **ROBERT R. JONES, M.D.**

Dr. Robert R. Jones was born on Sept. 22, 1912, in Chicago, Illinois. He attended Augustana College, Rock Island, Illinois, from 1933 to 1936 and received the B. S. (1936) and M.D. (1940) degrees from the University of Illinois, Chicago. He interned at Jersey City Medical Center (New Jersey) from 1940 to 1941 and then served in the U. S. Army from 1941 to 1954. Dr. Jones was in the Mayo Graduate School of Medicine 1949 to 1950 as a fellow in anesthesiology. After military service, he was appointed a consultant in 1954 and was promoted to assistant professor of anesthesiology in the Mayo Graduate School of Medicine in 1967. Dr. Jones was certified by the American Board of Anesthesiology. He was recognized by his colleagues in anesthesiology and surgery as a master of diagnostic and therapeutic nerve blocks. He is a fellow of the American College of Anesthesiologists. Dr. Jones retired from the Mayo Clinic in 1977. He and his wife Dorothy have four children.



### **MICHAEL J. JOYNER, M.D.**

Dr. Michael J. Joyner was born in Lafayette, Louisiana, on Aug. 8, 1958. In 1961, his family moved to Tucson, Arizona, where he subsequently graduated from the University of Arizona College of Medicine in 1987. Dr. Joyner began his residency training in anesthesiology at the Mayo Graduate School of Medicine in Rochester in 1987. In addition to his clinical training, he received 2 years of research training under the supervision of Drs. Kai Rehder and John T. Shepherd. He was appointed a senior associate consultant in 1993. Three years later, he obtained the rank of consultant. In 1991, he was appointed an assistant professor of anesthesiology, and in 1996, he was promoted to an associate professor of anesthesiology in the Mayo Medical School. Dr. Joyner was promoted to the rank of professor of anesthesiology in 1999. Dr. Joyner has had a long-term interest in the applied physiology and pharmacology of the cardiovascular and respiratory systems in humans. This interest began before he entered medical school. While at the Mayo Clinic, he received the Donald Church Balfour Award for outstanding research by a clinical resident and the Harold J. Lamport



Award from the American Physiological Society in recognition of his excellence as a young investigator. Currently, Dr. Joyner directs an active laboratory in the department of anesthesiology at the Mayo Clinic and his work is funded by the National Institutes of Health.

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### **GERARD S. KAMATH, M.D.**

Dr. Gerard S. Kamath was born in 1956. He was a resident at the Mayo Graduate School of Medicine in critical care medicine from 1989 to 1991. In 1993, he was appointed a senior associate consultant. Currently, he is a consultant at Mayo Clinic Rochester.



### **STANLEY KARANSKY, M.D.**

Dr. Stanley Karansky was born on Aug. 6, 1916, in New York, New York. He attended Columbia College in New York from 1933 to 1937. He then studied medicine at Duke University, Durham, North Carolina, from 1937, earning the M.D. degree in 1941. After his internship at Duke University Hospital from 1941 to 1942, he served in the U. S. Army from 1942 to 1946 and again from 1949 to 1955. Between the periods of military service, he was in private practice. Dr. Karansky joined the staff of the Mayo Clinic in 1955 as a consultant. He resigned from the Mayo Clinic in 1958. He and his wife Mary had five children.



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### **ZVONIMIR S. KATUSIC, M.D., Ph.D.**

Dr. Zvonimir S. Katusic was born in Zemun, Yugoslavia, on Aug. 16, 1952. He received the M.D. degree from the University of Belgrade in Yugoslavia in 1977. He also received the M. S. and Ph.D. degrees in pharmacology from the University of Belgrade. From 1979 to 1983, Dr. Katusic was an assistant professor in pharmacology at the Medical School, University of Belgrade. From 1983 to 1985, Dr. Katusic was a research fellow at the Mayo Clinic in the department of physiology and biophysics, working under the supervision of Drs. John T. Shepherd and Paul M. Vanhoutte. He returned to Dr. Shepherd's laboratory in 1987, and in 1989, he became a research associate in the department of anesthesiology. From 1992 to 1993, Dr. Katusic was a Mayo Clinic Scholar in Research at the Johns Hopkins University in Baltimore, Maryland. He joined the department in 1993 and was appointed a consultant in 1996. He is director of the vascular molecular biology laboratory in the department of anesthesiology and a professor of anesthesiology and pharmacology in the Mayo School of Medicine. Dr. Katusic's research has been focused on the local regulation of cere-



bral arterial tone, mechanisms underlying pathogenesis of cerebral vasospasm, and development of novel pharmacological and gene transfer approaches in the prevention and treatment of cerebrovascular disease and brain ischemia. He is a member of the editorial boards of *Stroke* and the *Journal of Cardiovascular Pharmacology*.

### **GEORGE E. KIMMEL, M.D.**

Dr. George Kimmel was born on Apr. 11, 1929, in Frankfort, Indiana. He obtained the M.D. degree in 1954 from Indiana University School of Medicine. After an internship at Good Samaritan Hospital in Phoenix, Arizona, he joined the U. S. Navy, serving from 1956 to 1961. From 1957 to 1959, he completed a residency in anesthesiology. After completing his service in the navy, he was in private practice of anesthesiology in Arlington Heights, Illinois, from 1961 to 1962, and was at Deaconess Hospital in Evansville, Indiana, from 1962 to 1968. From 1968 to 1973, he was a consultant in the department of anesthesiology at the Mayo Clinic Rochester. After leaving the Mayo Clinic, he returned to private practice in Evansville, Indiana, from which he retired in 1999. Dr. Kimmel became certified by the American Board of Anesthesiology in 1963. He is a fellow of the American College of



Anesthesiologists and a member of the American Society of Anesthesiologists and the International Anesthesia Research Society.

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### **DONALD R. KRABILL, M.D.**

Dr. Donald R. Krabill was born on Nov. 4, 1931, in Canton, Ohio. He had his undergraduate education at Mount Union College in Alliance, Ohio, from 1949 to 1953. After graduation with the B.S. degree, he matriculated at the University of Cincinnati College of Medicine (Ohio) and received the M.D. degree in 1957. Dr. Krabill served his internship at Christ Hospital, Cincinnati, from 1957 to 1958. In 1958, he entered the Mayo Graduate School of Medicine as a fellow in anesthesiology. He was certified by the American Board of Anesthesiology in 1962. He was in the U. S. Army from 1961 to 1963 and in private practice in Casper, Wyoming, from 1963 to 1965. In 1965, Dr. Krabill joined the staff of the Mayo Clinic, Rochester, as a consultant. He was promoted to an assistant professor of anesthesiology in the Mayo Medical School in 1976. He and his late wife Pauline have two children.



### **JONATHAN S. KROHN, M.D.**

Dr. Jonathan S. Krohn was born on Oct. 8, 1963, in Brooklyn, New York. He graduated from Pennsylvania State University (University Park, Pennsylvania) in 1983, receiving the B. S. degree with highest honors. In 1985, he was awarded the M.D. degree from Jefferson Medical College, Philadelphia, Pennsylvania. He served an internship in internal medicine at Mercy Catholic Medical Center in Darby, Pennsylvania, from 1985 to 1986 and served a residency in anesthesiology from 1986 to 1988 at Mercy Hospital, Pittsburgh, Pennsylvania. In 1988, he entered the Mayo Graduate School of Medicine as a fourth-year resident in regional anesthesia and in neuroanesthesia. Dr. Krohn was certified by the American Board of Anesthesiology and was appointed a senior associate consultant at the Mayo Clinic, Rochester, in 1989. He resigned from the Mayo Clinic in 1990.



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### **BARBARA R. KRUPIN, M.D.**

Dr. Barbara R. Krupin was born on Dec. 7, 1943, in Minneapolis, Minnesota. She received her undergraduate education from 1961 to 1962 at Itasca Junior College (Itasca, Minnesota) and from 1962 to 1964 at the University of Minnesota (Minneapolis). In 1968, she received the M.D. degree from the University of Minnesota. She completed an internship from 1968 to 1969 in medicine and pediatrics at the University of Utah Medical Center (Salt Lake City) and a residency in internal medicine from 1969 to 1970 at St. Luke's Hospital (St. Louis, Missouri). After her residency, she began private practice in Wichita Falls, Texas. From 1972 to 1974, she was a resident in anesthesiology at the Washington University School of Medicine in St. Louis, and from 1974 to 1976, she was a consultant in anesthesiology at Barnes Hospital. In 1976, she was appointed an assistant professor of anesthesiology at the Washington University School of Medicine. In 1978, she was appointed a consul-



tant at the Mayo Clinic in Rochester and an assistant professor of anesthesiology in the Mayo Medical School. She resigned from the Mayo Clinic in 1979.

### **RONALD P. KUFNER, M.D.**

Dr. Ronald P. Kufner was born in Klamath Falls, Oregon, and lived there until coming to Rochester for advanced medical training. He graduated from Portland State University (Oregon) with the B. S. degrees in psychology and general sciences. He received the M.D. degree from Oregon Health Sciences University (Portland) in 1989. After his training in anesthesiology at the Mayo Graduate School of Medicine, he was appointed a senior associate consultant in 1993 and a consultant in 1996. His interests include anesthesia for liver transplantation and regional anesthesia. He lives in Rochester with his wife Paula. They have three sons.



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### **MATTHEW M. KUMAR, M.D.**

Dr. Matthew M. Kumar was born on May 18, 1957, in a small town in southern India. He earned his medical diploma from Madurai Medical College, Madurai, India. Subsequently, he obtained a postgraduate degree in general surgery from Madras University in Madras, India. He then immigrated to the U. S. and worked first as a graduate student in anatomy at the University of Texas in San Antonio. After he had served an internship in surgery at Albert Einstein College of Medicine in the Bronx, New York, and had completed a residency in anesthesiology at the State University of New York in Buffalo, New York, he entered the Mayo Graduate School of Medicine for a fellowship in critical care. In 1992, he was appointed a consultant at the Mayo Clinic in Rochester. Currently, Dr. Kumar is completing a law degree program at



the William Mitchell College of Law in St. Paul, Minnesota. Dr. Kumar is single.

### STEVE E. KUNKEL, M.D.

Dr. Steve E. Kunkel was born on Mar. 17, 1953, in Hutchinson, Minnesota. He entered the University of Missouri in Columbia, Missouri, in 1971 and earned the B. A. degree in 1975. From 1975 to 1979, he studied medicine at the Washington University School of Medicine in St. Louis, Missouri. Thereafter, he entered the Mayo Graduate School of Medicine as a resident in internal medicine from 1979 to 1981 and a resident in anesthesiology from 1981 to 1983. In 1984, he was certified by the American Board of Anesthesiology. In 1983, he was appointed an instructor of anesthesiology in the Mayo Medical School and a consultant. He resigned from the Mayo Clinic in 1989, and joined Anesthesia Physicians, Inc. in Sioux Falls, South Dakota.



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### LOUIS GASTON LABAT, M.D.

Dr. Louis Gaston Labat was born on Dec. 11, 1876, in Victoria, on Mahe, an island of the Seychelles. He matriculated in the faculty of sciences in 1913 and received the baccalaureate degree in chemistry, physics, and natural sciences from the University of Montpellier (France) in 1914. From 1914 to 1916, he was a student in the faculty of medicine of the University of Montpellier. In 1919, he transferred to the University of Paris. In 1921, he published, with Drs. Victor Pauchet and Paul Sourdat, the third edition of the book *L'Anesthesie Regionale*. On Sept. 1920, Dr. Labat joined the Mayo Clinic as a special lecturer in regional anesthesia. In Rochester, he gave lectures on all aspects of regional anesthesia to the surgeons. In 1922, he published the book *Regional Anesthesia: Its Techniques and Clinical Application*, a commercially successful text. In October 1921, Dr. Labat resigned from the Mayo Clinic and moved to New York City. In 1923, he founded the "original"



American Society of Regional Anesthesia. In New York City, he held the rank of clinical professor of surgery at University and Bellevue hospitals. Dr. Labat was married to Marguerite Brunaud. On Oct. 1, 1934, Dr. Labat died.

### **TIM J. LAMER, M.D.**

Dr. Tim J. Lamer was born in 1957 and raised in Wausau, Wisconsin. He graduated from the University of Wisconsin, Madison, with the B.S. degree in chemistry in 1979. He remained in Madison to attend medical school and received the M.D. degree in 1983. After graduating from medical school, he moved to Rochester, Minnesota, for his internship and residency in anesthesiology. After finishing his residency in 1986, he spent 1 year as an associate consultant working in the pain clinic under the guidance of Drs. Lee A. Nauss and Peter R. Wilson. He was appointed a senior associate consultant in 1987 and a consultant in 1990. In 1991, Dr. Lamer transferred to the Mayo Clinic Jacksonville (Florida). In Jacksonville, he helped establish the pain clinic and the pain management fellowship. He was appointed chair of the pain services division in 1992 and chair of the department of anesthesiology in 1996. His major clinical, teaching, and research interests include spine pain, post-



operative analgesia, and regional anesthesia. He is married to his high school girlfriend Joan. They have two sons and one daughter.

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### **WILLIAM L. LANIER, M.D.**

Dr. William L. (Bill) Lanier was born on June 8, 1955, in Statesboro, Georgia. He received the M.D. degree from the Medical College of Georgia (Augusta) in 1980. He served a residency at Wake Forest University Medical Center, Winston-Salem, North Carolina. He began a fellowship in clinical neuroanesthesia and neuroanesthesia research at the Mayo Clinic in 1983. In 1984, he was appointed an associate consultant, in 1985, a senior associate consultant, and in 1987, a consultant. In 1985, Dr. Lanier was promoted to professor of anesthesiology in the Mayo School of Medicine. In 1986, he received the Mayo Individual Award for Excellence. He has authored or co-authored more than 130 papers. His research interest is focused on the acute treatment of ischemic brain injury and improving the care of patients undergoing neurosurgical operations. Dr. Lanier served as president of the Society of Neurosurgical Anesthesiology and Critical Care from 1993 to 1994, and he is an associate examiner for the American Board of



Anesthesiology. In 1999, Dr. Lanier was appointed editor-in-chief of the *Mayo Clinic Proceedings*. He is also editor of *Journal of Neurosurgical Anesthesiology*. He and his wife Mary have two children.

### **JOEL S. LARSON, M.D.**

Dr. Joel S. Larson was born in Marshall, Minnesota, in 1957. He graduated from Drake University (Des Moines, Iowa) in 1979 and from Medical School at St. Louis University (Missouri) in 1983. He served a residency in internal medicine and anesthesiology at the Mayo Graduate School of Medicine. He was certified by the American Board of Internal Medicine and the American Board of Anesthesiology. He joined the Mayo Clinic Rochester, as a senior associate consultant in 1988 and was promoted to consultant in 1991. He transferred to the Mayo Clinic Scottsdale, in 1992, and became vice chair of anesthesiology in 1996 and chair of critical care in 1998. Currently, his practice is totally devoted to critical care medicine. He lives in Scottsdale (Arizona) with his wife Michele.



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### **CAROL ANN LAU, M.D.**

Dr. Carol Ann Lau was born on Jan. 14, 1953, in San Francisco, California. She graduated from Loma Linda University College of Arts and Sciences, Riverside, California, in 1975. In 1979, she received the M.D. degree, magna cum laude, from Loma Linda University School of Medicine (Loma Linda). She completed a rotating internship at White Memorial Hospital Center in Los Angeles, California in 1980 and a residency in anesthesiology at Loma Linda University Medical Center in 1982. From 1982 to 1983, she completed a fellowship in pediatric anesthesia at Children's Hospital of Denver. Dr. Lau was certified by the American Board of Anesthesiology in 1983. In 1983, Dr. Lau joined the department of anesthesiology at Loma Linda University Medical Center. Subsequently, she was an assistant director of the pediatric intensive care unit and chief of pediatric anesthesiology. In 1992, Dr. Lau was appointed a senior associate consultant



at the Mayo Clinic. After her husband completed his training at the Mayo Clinic, she resigned from the Mayo Clinic and resumed her position at Loma Linda University Medical Center in 1993.

### **VAN S. LAWRENCE, M.D.**

Dr. Van S. Lawrence was born in Omaha, Nebraska, on June 15, 1925. He attended Hamline University, St. Paul, Minnesota, for 1 year before joining the U.S. Army in 1943. He served with the 70th Infantry Division in Europe and was discharged as a staff sergeant in time to resume premedical studies at the University of Minnesota (Minneapolis) in 1946. He graduated from the University's Medical School in 1951, and joined a general practice group in Montana for 4 years before starting a residency in anesthesiology in Tacoma, Washington. He was appointed chief of anesthesiology at Minneapolis General Hospital (Minneapolis) in 1960. In 1962, he became a Diplomate of the American Board of Anesthesiology, and in 1966, he joined the Mayo Clinic as a consultant and was appointed an instructor of anesthesiology in the Mayo Medical School. Dr. Lawrence returned to Minneapolis to direct the department of anesthesia of Mount Sinai Hospital in 1968, where he was involved in the management of pain by regional anesthesia and in the training of medical students in anes-



thasia. He was appointed a clinical assistant professor at the University of Minnesota in 1968 and later, a clinical associate professor. Dr. Lawrence retired in 1992. He and his wife Dulcie Witt Lawrence have five children.

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### **SCOTT EDWARD LeBARD, M.D.**

Dr. Scott Edward LeBard was born on Aug. 16, 1956, in Wayzata, Minnesota. He received his undergraduate education at Pacific Union College in Angwin, California. He then attended Loma Linda University in Loma Linda, California, and was awarded the M.D. degree in 1983. After an internship at Loma Linda University Medical Center, he served a residency in pediatrics from 1984 to 1986 and a residency in anesthesiology from 1986 to 1988 at Loma Linda. This training was followed by a fellowship in anesthesiology and critical care medicine at Children's Hospital of Philadelphia. He joined the Mayo Clinic in 1990 as a senior associate consultant. In 1994, he became a consultant. Dr. LeBard resigned from the Mayo Clinic in 1999 to practice in the Twin Cities (Minnesota). He and his wife Daina have one child.



### **DWIGHT C. LEGLER, M.D.**

Dr. Dwight C. Legler was born on Sept. 15, 1951, in Red Wing, Minnesota. He received the degrees of B. S. and M.D. from the University of Minnesota (Minneapolis). Dr. Legler spent 1 year at Harvard University (Cambridge, Massachusetts) before entering a residency in anesthesiology at the Mayo Graduate School of Medicine in 1979. Dr. Legler was appointed a consultant in 1983. In 1985, he was promoted to an assistant professor of anesthesiology in the Mayo Medical School. Dr. Legler had an interest in the metabolism of anesthetic drugs and worked with Dr. Russell A. Van Dyke. Dr. Legler died on May 2, 1986.



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### **CRAIG H. LEICHT, M.D.**

Dr. Craig H. Leicht was born in California's wine country on Feb. 17, 1954. In 1982, he graduated from Loma Linda University School of Medicine (Riverside) and School of Public Health, receiving the M.D. and M. P. H. degrees. He completed residency training in anesthesiology at the Naval Regional Medical Center, San Diego, in 1985 and training in anesthesia for obstetrics in 1986 at the University of California, San Francisco. Dr. Leicht came to the Mayo Clinic, Rochester, in 1990 and served as co-director/director of obstetric anesthesia until 1995. He was appointed an assistant professor of anesthesiology in the Mayo Medical School. In 1991, he was appointed by the Board of Trustees of the American Medical Association to the Accreditation Council for Graduate Medical Education, where he served three 2-year terms on the Residency Review Committee for Anesthesiology. Currently, Dr. Leicht is the resi-



dency program director and director of obstetric anesthesia at the Western Pennsylvania Hospital in Pittsburgh, Pennsylvania.

### **ROBERT L. LENNON, D.O.**

Dr. Robert L. Lennon was born on Mar. 30, 1940, in Coldwater, Michigan. In 1963, he graduated from Graceland College, Lamoni, Iowa, with the B. A. degree. He then attended the Chicago College of Osteopathic Medicine in Chicago (Illinois) and received the D. O. degree in 1967. He served an internship at Oklahoma Osteopathic Hospital in Tulsa, Oklahoma, from 1967 to 1968. From 1970 to 1972, he was a resident at the Garden City Osteopathic Hospital, Garden City, Michigan, and from 1980 to 1982 at the Mayo Graduate School of Medicine. He was certified by the AOBA in 1980 and by the American Board of Anesthesiology in 1984. He joined the staff of the Mayo Clinic in 1984. Dr. Lennon served as director of the nurse anesthesia program of the Mayo School of Health-Related Sciences from 1987 to 1991. In 1991, he was promoted to associate professor of anesthesiology in the Mayo School of Medicine, and from 1992 to 1994, he was head of the orthopedics section of anesthesiology at Rochester Methodist Hospital. He served in the U.S. Army, both active and reserve. He retired from reserve status, having



attained the rank of brigadier general, his last duty assignment being commanding general of the 807<sup>th</sup> Medical Brigade from 1993 to 1997. Dr. Lennon resigned from the Mayo Clinic in 1994. He practices anesthesiology and pain medicine at Presbyterian Hospital Systems in Charlotte, North Carolina. He and his wife Kit have two children.

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### **PAUL F. LEONARD, M.D.**

Dr. Paul F. Leonard was born on Nov. 3, 1926, in Red Oak, Iowa. He received the B. A. degree in physics from Nebraska Wesleyan University in Lincoln, Nebraska, in 1948. His education was interrupted by service in the U. S. Navy in 1945. Dr. Leonard obtained the B. S. degree in electrical engineering from the University of Nebraska College of Engineering in Lincoln in 1952 and the M.D. degree from the University of Nebraska College of Medicine, Omaha, Nebraska, in 1959. He interned at Charles T. Miller Hospital in St. Paul, Minnesota. In 1960, he entered the Mayo Graduate School of Medicine as a fellow in anesthesiology. After his residency, he worked in the medical applications department of IBM (International Business Machines) from 1963 to 1964. In 1964, he was appointed a consultant at the Mayo Clinic. In 1965, he was certified by the American Board of Anesthesiology, and in 1978, he was promoted to associate professor of anesthesiology in the Mayo Medical School. In 1984, he became head of the orthopedic anesthesiology



section at St. Marys Hospital (Rochester). His major research interest was electrical safety in the operating room. Dr. Leonard and his wife Vivita, also an anesthesiologist, have two children. Dr. Leonard died on Sept. 18, 1998.

### **BRUCE JAMES LEONE, M.D.**

Dr. Bruce James Leone was born in Boston, Massachusetts, on Nov. 23, 1957. He received his undergraduate degree from Harvard College (Cambridge, Massachusetts) in 1978 and the M.D. degree from the University of Florida (Gainesville) in 1982. Dr. Leone served an internship at Baylor University Medical Center in Dallas, Texas, and a residency in anesthesiology at Parkland Memorial Hospital (Dallas). Dr. Leone was an Honorary Senior Registrar in the Nuffield Department of Anaesthetics at Oxford, England, from 1985 to 1988 and a fellow in cardiac anesthesiology at Duke University (Durham, North Carolina) from 1988 through 1989. He was appointed to the staff in the department of anesthesiology of Duke University as a research consultant in 1988, an assistant professor of anesthesiology in 1989, an associate professor in anesthesiology in 1993, and an assistant professor of medicine in 1994. Dr. Leone was founder and director of the anesthesiology cardiopulmonary research laboratory in the department of anesthesiology of Duke University. Dr. Leone was certified by the American Board of Anesthesiology in 1986. Dr. Leone won second place in the residents' research essay contest sponsored by the American Society of Anesthesiologists in 1987 and won the B. B. Sankey Award for



Anesthesia Advancement in 1989. He also received peer-reviewed research grants from the American Society of Anesthesiologists, the North Carolina Affiliate of the American Heart Association, the American Heart Association, and the National Institutes of Health. Dr. Leone joined the Mayo Clinic Jacksonville, Florida, in 1998. Currently, he is a senior associate consultant and an associate professor of anesthesiology in the Mayo Medical School. Dr. Leone is director of anesthesia services at St. Luke's Hospital in Jacksonville, Florida.

### **JOHN B. LESLIE, M.D.**

Dr. John B. Leslie was born in Okmulgee, Oklahoma, on June 24, 1952. Dr. Leslie went east for undergraduate and medical training at Johns Hopkins University in Baltimore, Maryland, and at Duke University in Durham, North Carolina. After completing medical training in 1976, he spent several years in the surgical training program at Duke University before transferring to anesthesiology. He completed a residency in anesthesia at Duke University, including specialized training in cardiac anesthesia and a fellowship in clinical pharmacology. During a decade on the faculty in anesthesia at Duke University and Duke Heart Center, Dr. Leslie held appointments as director of the residency program, chief of cardiac anesthesia, and director of the cardiac fellowship program. In time, however, Dr. Leslie could not resist the opportunity to return to the sunshine of southwestern United States with his wife Carolyn Leslie, a registered nurse, and their two sons, Brian and Steven. Initially, Dr. Leslie joined the University of Arizona faculty in Tucson but soon was appointed to the staff of the Mayo



Clinic, Scottsdale. He is a professor of anesthesiology in the Mayo Medical School. Dr. Leslie serves as medical director of perioperative services for the Mayo Clinic Scottsdale, and on numerous hospital, institutional, and national anesthesiology association committees.

### **STEN G.E. LINDAHL, M.D., Ph.D.**

Dr. Sten Lindahl was born on Apr. 22, 1945, in Malmö, Sweden. He received the M.D. degree in 1971 from the University of Lund, Lund, Sweden. After 5 years of training in pediatrics, including 1½ years in pediatric surgery, he completed a 4-year residency in anesthesia at University Hospital in Lund and was certified in pediatrics and in anesthesiology in 1981. During his residency, he was a Ph. D. candidate and received his degree in 1977. In 1982, he was promoted to associate professor of anesthesiology at the University of Lund, and from 1984 to 1986, he was appointed head of pediatric anesthesia at the University of Lund. During this tenure, he spent 4- to 6-month periods as a clinical research fellow with Dr. David Hatch at the Hospital for Sick Children, Great Ormond Street, London, England, and with Dr. Kai Rehder at the Mayo Clinic, Rochester. From 1986 to 1988, Dr. Lindahl worked at the Mayo Clinic. After a period as a special clinical fellow, Dr. Lindahl became a senior associate consultant and was promoted to associate professor of anesthesiology in the Mayo Medical School. In September 1988, Dr. Lindahl resigned from the Mayo Clinic and returned to Sweden. In 1990, Dr. Lindahl was appointed professor and chair of the department of anesthesi-



ology and intensive care at the Karolinska Hospital and Karolinska Institute, Stockholm. He served 6 years on the board of the Karolinska Institute and since 1996 has been an ordinary member of the Nobel Committee, where he serves now as the Deputy Chair. Dr. Lindahl is a member of the editorial board of *Anesthesia and Analgesia*. He is married to Ulla, and they have two daughters, Jenny and Maria.

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### **JOHN WALTER LINSTROMBERG, M.D.**

Dr. John Walter Linstromberg was born on June 23, 1947, in Jacksonville, Illinois. He attended the University of Nebraska in Lincoln, and the University of Missouri in Columbia where he received the B. S. degree in chemistry in 1973. From 1973 to 1977, he studied medicine at the University of Nebraska Medical Center in Lincoln and was awarded the M.D. degree in 1977. From 1977 to 1980, he served a residency at the University of Nebraska Medical Center. In 1980, he was appointed a consultant at the Mayo Clinic in Rochester, and an instructor of anesthesiology in the Mayo Medical School. He is certified by the American Board of Anesthesiology. He resigned from the Mayo Clinic in 1983.



### **DOUGLAS J. LOBERG, M.D.**

Dr. Douglas J. Loberg was born on May 19, 1949. He served a residency at the Mayo Graduate School of Medicine from 1975 to 1978. He was appointed an associate consultant in 1978 and a consultant in 1979 at the Mayo Clinic, Rochester. Dr. Loberg resigned from the Mayo Clinic in 1981.



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### **THOMAS JAMES LOSASSO, M.D.**

Dr. Thomas James Losasso was born on Mar. 26, 1959, in Chicago, Illinois. He received his undergraduate education at Marquette University, Milwaukee, Wisconsin, from 1977 to 1981, when he earned the B. S. degree in electrical engineering. From 1981 to 1985, he studied medicine at Stritch School of Medicine of Loyola University (Chicago). He entered the Mayo Graduate School of Medicine as a resident in anesthesiology in 1985. He was appointed a senior associate consultant in 1989 and a consultant in 1992. He resigned from the staff of the Mayo Clinic in 1995.



## **RICHARD O. LUNDBORG, M.D.**

Dr. Richard O. Lundborg was born on Mar. 6, 1933, in Milan, Minnesota. He graduated from Gustavus Adolphus College, Saint Peter, Minnesota, in 1955 and received the M.D. degree from the University of Minnesota, Minneapolis, in 1959. That summer, he entered the U. S. Army for a 1-year internship at Tripler Army Hospital in Honolulu, Hawaii. From 1960 to 1962, he was battalion surgeon in the 34<sup>th</sup> Armor Tank Battalion (4<sup>th</sup> Infantry Division) at Fort Lewis, Washington. Dr. Lundborg was a resident in anesthesiology at the Mayo Graduate School from 1962 to 1965 and became a consultant at the Mayo Clinic, Rochester, in 1965, working primarily in cardiothoracic and obstetrical anesthesia. He was appointed an assistant professor of anesthesiology in the Mayo Graduate School of Medicine in 1970. In 1972, Dr. Lundborg became the first anesthesiologist on the Big Island (Hawaii). He was chief of anesthesiology at Hilo Hospital from 1972 through 1982. In 1986, he embarked on a 10-year advocacy for health reform as a legislative consultant with the Hawaii Medical Association, a candidate for the state legislature, and a volunteer on political



campaigns. Dr. Lundborg received a distinguished alumni award in medicine from Gustavus Adolphus College in 1976 and was honored as the physician of the year for community service (state of Hawaii) in 1981. He is now retired and lives with his wife JoAnn in Leavenworth, Washington. They have three children and six grandchildren.

## JOHN S. LUNDY, M.D.

Dr. John S. Lundy was born on July 6, 1894, in Inkster, North Dakota. He received the M.D. degree from Rush Medical College (Chicago, Illinois). After an internship at Harper Hospital in Detroit (Michigan) from 1919 to 1920, he served in private anesthesia practice from 1920 to 1924 in Seattle (Washington). In 1924, Dr. Lundy joined the medical staff of the Mayo Clinic and was appointed the head of section on anesthesia. Dr. Lundy remained in that capacity until 1952, when he became a senior consultant. In 1934, Dr. Lundy was promoted to professor of anesthesia. Dr. Lundy was a visionary and a pioneer. He was among the first to introduce the concept of "balanced anesthesia" and the clinical use of pentothal. He was instrumental in the development of the postanesthesia-recovery room and in blood preservation in the United States. Dr. Lundy published extensively on many subjects in anesthesia. He authored the text *Clinical Anesthesia* in 1942. Dr. Lundy was an effective organizer. He was a founder of the section of anesthesiology in the American Medical Association and the American Board of Anesthesiology, Inc. (1937). He was president of the American Society of Anesthesiologists (ASA) (1946) and American Board of Anesthesiology (1942), and an editor of *Anesthesiology*. Dr. Lundy received many honors, including the honorary doctor of laws degree from Hahneman Medical College of Philadelphia, doctor of science degree from the University of North Dakota (Fargo), honorary license to practice medicine in



North Dakota, Distinguished Service Award of the ASA, and the gold medal of the Canadian Anesthetists' Society. During World War II (1939 to 1945), Dr. Lundy was a national consultant in anesthesia for the Wartime Graduate Medical Meetings held in Washington, D. C. He also served as a civilian consultant in anesthesiology to the office of the Surgeon General, U. S. Army, and he was a member of the subcommittee on anesthesia of the National Research Council in Washington, D. C. Dr. Lundy retired from the Mayo Clinic in October 1959 to practice anesthesiology in Chicago (Illinois) and Seattle (Washington). He and his wife Lenore had three children. Dr. Lundy died on Apr. 26, 1973.

### **JEFFREY J. LUNN, M.D.**

Dr. Jeffrey J. Lunn was born in Bismarck, North Dakota, on Sept. 19, 1952. He received the M.D. degree in 1979 from the University of North Dakota (Fargo) and finished his residency in anesthesiology in 1983 at the Mayo Graduate School of Medicine. He was appointed an instructor of anesthesiology in the Mayo Medical School in 1982 and a consultant in 1983. Dr. Lunn left the Mayo Clinic, Rochester, in 1984 to return to Bismarck, North Dakota, where he practiced anesthesiology and critical care medicine. He returned to the Mayo Clinic in 1986. Dr. Lunn was certified by the American Board of Anesthesiology in 1984, and he received special qualifications in critical care medicine in 1986. He transferred to the Mayo Clinic Scottsdale, Arizona in 1992 where he served in various capacities, including chair of the department of anesthesiology, chair of critical care medicine, and chair of the clinical practice committee, as well as in other administrative duties. Dr. Lunn



returned to the Mayo Clinic, Rochester, in 1998, and continues to practice anesthesiology and critical care medicine. He and his wife Barbara have two children.

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### **ROBERT J. LUNN, M.D.**

Dr. Robert J. Lunn was born on Dec. 8, 1958, in North Dakota. He began a residency at the Mayo Graduate School of Medicine in 1986. In 1989, he was appointed a senior associate consultant, and in 1992, a consultant at the Mayo Clinic. Dr. Lunn resigned from the Mayo Clinic in 1996.



### **LON J. LUTZ, M.D.**

Dr. Lon J. Lutz was born in Dickinson, North Dakota, on Sept. 18, 1957. He received the B.S. degree in pharmacy from North Dakota State University (Fargo) and was a member of Rho Chi honor fraternity. Dr. Lutz is also a member of Sigma Alpha Epsilon fraternity. After graduating with Alpha Omega Alpha honors from the University of North Dakota in 1985, Dr. Lutz became a resident in general surgery at Hennipen County Medical Center in Minneapolis (Minnesota) until 1987, when he arrived in Rochester to begin his training at the Mayo Graduate School of Medicine. Dr. Lutz served for 1 year as an associate consultant before entering the private practice of pain medicine in 1991. Dr. Lutz was certified by the American Board of Anesthesiology in 1991 and in pain medicine in 1995. He is an active member of the International Spinal Injection Society. Dr. Lutz is a co-founder of Medical Advanced Pain



Specialists in Minneapolis-St. Paul. He has two children, William and Olivia, and lives in St. Paul, Minnesota.

### **RONALD A. MACKENZIE, D.O.**

Dr. Ronald A. MacKenzie was born on Mar. 31, 1938, in Detroit, Michigan. He graduated from Alma College, Alma, Michigan, with the B.S. degree in 1961, after which he attended medical school at the University of Health Sciences, Kansas City, Missouri, from which he received the D. O. degree in 1967. Dr. MacKenzie served a residency in anesthesiology at Detroit Osteopathic Hospital from 1970 to 1972, at the Cleveland Clinic from 1972 to 1973, and at the Mayo Graduate School of Medicine from 1973 to 1974. He was certified by the American Board of Anesthesiology in 1978. Dr. MacKenzie was appointed a consultant at the Mayo Clinic in 1974 and an assistant professor of anesthesiology in the Mayo Medical School in 1976. He was named head of south section in the Rochester Methodist Hospital in 1984. He served as chair of the GYN/ENT anesthesia division and vice chair of the department of anesthesiology from 1988 to 1998. Intramurally, Dr. MacKenzie was a member of numerous committees. He was twice named teacher of the year by the Mayo Graduate School of Medicine. Extramurally, he served the



American Society of Anesthesiologists, first as director, then assistant secretary, secretary, and first vice president (1998), president elect (1999), and president (2000). He was also active in the Minnesota Society of Anesthesiologists and was its president in 1991. Dr. MacKenzie and his wife Nancy have two children.

### **DAVID MACKEY, M.D.**

Dr. David Mackey was appointed a senior associate consultant at the Mayo Clinic Jacksonville, in 1988.



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### **HAROLD MICHAEL MARSH, M.D.**

Dr. Harold Michael Marsh was born on Mar. 7, 1939. He received the B.S. degree (medical) with honors and the Bachelor of Medicine, Bachelor of Surgery degrees from the University of Sydney (Australia) in 1964. After an internship and fellowship at Royal Prince Alfred Hospital in Sydney, Australia, he became a fellow of the Faculty of Anaesthetists, Royal Australasian College of Surgeons in 1968. In 1969, he took a fellowship in anesthesiology/critical care medicine at the Mayo Clinic. He returned to Royal Prince Alfred Hospital as director of intensive care in 1972. In 1974, he returned to the Mayo Clinic as a consultant in the section of critical care medicine. He was promoted to associate professor of anesthesiology in the Mayo Medical School in 1989. He was certified by the American Board of Anesthesiology (ABA) in 1981 and certified in critical care by the ABA in 1986. In 1989, Dr. Marsh became chairman of the department of anesthesiology, Henry Ford Health System, Detroit, Michigan. He served on the board of governors, Henry Ford Medical Group. In 1998, he became professor and chair of the department of



anesthesiology, Wayne State University, Detroit, Michigan. Dr. Marsh served as associate editor of *Clinical Anesthesiology* and Editor of the *Journal of Cardiothoracic and Vascular Anesthesia*. Dr. Marsh is married to Elizabeth Eleanor Kerr. They have three children.

### **KENNETH A. MARSHALL, M.D.**

Dr. Kenneth A. Marshall was born in Latrobe, Pennsylvania, on Dec. 22, 1955. He received the M.D. degree from the University of Pennsylvania School of Medicine (Philadelphia) in May 1982. He was certified by the American Board of Anesthesiology (ABA) in 1994. In 1994, he received from the ABA the certificate of added qualifications in pain management. Dr. Marshall was appointed a senior associate consultant at the Mayo Clinic Jacksonville, in 1993. He became a senior consultant in 1996. Dr. Marshall was an instructor of anesthesiology at the Mayo Medical School from 1993 until 1998, when he was promoted to assistant professor. He has served on many Mayo Clinic and Saint Luke's Hospital (Jacksonville) committees and became the director of the Mayo Clinic Jacksonville, fellowship program in pain management in 1996. Currently, Dr. Marshall resides in Ponte Vedra Beach,



Florida, with his wife Martha Jane File and their two children.

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### **JOHN T. MARTIN, M.D.**

Dr. John Thomas Martin was born on June 8, 1924, in Cleveland, Ohio. He received the M.D. degree from the University of Cincinnati College of Medicine in 1948. After an internship at Cincinnati General Hospital, he served in the Medical Corps of the U. S. Air Force. After a residency in anesthesiology, he became vice chairman of the department of anesthesiology at Wilford Hall in San Antonio, Texas. In 1957, he entered private practice. He was appointed a consultant at the Mayo Clinic in 1958. He participated in the design of Rochester Methodist Hospital of the new operating rooms and was appointed the first head of the methodist hospital section in 1966. Dr. Martin left the Mayo Clinic in 1972 to become chairman of the department of anesthesiology at Ochsner Clinic in New Orleans, Louisiana. In 1974, he joined the department of anesthesiology at Medical College of Ohio at Toledo as professor of anesthesiology. Dr. Martin was president of the Minnesota, Ohio, and Toledo societies of anesthesiologists. He was a member and chairman of the board of trustees of the International



Anesthesia Research Society and from 1966 to 1977 was an associate editor of *Anesthesia and Analgesia*. He was the editor of the text *Positioning in Anesthesia and Surgery*. He and his wife Marion have six children.

### **DAVID P. MARTIN, M.D., Ph.D.**

Dr. David P. Martin, was born in Cincinnati, Ohio, on Apr. 28, 1964. He earned the B.S. degree in biochemistry at Indiana University (Bloomington) in 1985 and then attended medical school at Washington University in St. Louis (Missouri). While at Washington University, he also earned the Ph. D. degree in neurobiology. He graduated from medical school in 1992 and completed a medical internship at St. John's Mercy Medical Center in St. Louis. Dr. Martin came to Rochester in 1993 to begin a residency in anesthesiology at the Mayo Graduate School of Medicine. He served as chief resident in his final year and was a delegate to the resident section of the American Society of Anesthesiologists. After a residency, he completed both a fellowship in clinical pain and a postdoctoral research fellowship. In 1997, he became a Diplomate of the American Board of Anesthesiology, with subspecialty certification in pain management in 1998. He was appointed a senior associate consultant at the Mayo Clinic, Rochester, in 1998 and an assistant professor of anesthesiology in the Mayo Medical School in 1999. His research interests are in the



basic pathophysiology of neuropathic pain. Dr. Martin is also involved in translational research on new methods of measuring clinical pain and the simulation of regional anesthesia using virtual reality. Currently, Dr. Martin serves as medical director of the pain clinic. Dr. Martin and his wife Laura have two sons.

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### **PATRICIA A.C. MARTIN, M.D.**

Dr. Patricia Martin was born on Apr. 19, 1963. She received her undergraduate education at the University of South Dakota (Vermillion), from which she received the B.S. degree in 1985. She studied medicine at the University of South Dakota from 1985 to 1989. She served an internship in internal medicine at the Mayo Graduate School of Medicine from 1989 to 1990. In 1990, she began a residency at the Mayo Graduate School of Medicine. In 1993, she was appointed a senior associate consultant. In 1995, she resigned from the Mayo Clinic.



### **MARK W. MARTINSON, M.D.**

Dr. Mark W. Martinson was born on Aug. 8, 1943, in Concordia, Kansas. He received the B.S. degree from the University of Maryland in 1973 and the M.D. degree in 1979 from Temple University in Pennsylvania. In 1979, he entered the Mayo Graduate School of Medicine as a fellow in anesthesia. In 1982, he was appointed an associate consultant at the Mayo Clinic. He resigned from the Mayo Clinic in June 1983.



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### **DAVID B. MASTERS, Ph.D.**

Dr. David B. Masters was born on May 23, 1958, in Rahway, New Jersey. He attended Rutgers University in New Jersey and received the M. A. degree in chemistry (1989) and the Ph.D. degree in behavioral and neural sciences (1992). He investigated analgesic systems and developed analgesic therapies as an anesthesiology research associate and N. I. H. co-investigator at Children's Hospital, Harvard Medical School. His work led to patented biodegradable devices for local delivery of analgesic agents, a start-up company, and promotion to instructor and senior staff in 1992. In 1993, he came to the Mayo Clinic to pursue industry-funded research. Currently, he is an associate consultant at the Mayo Clinic. With the support of Dr. Gary Sieck, he was awarded an N. I. H. grant to study polymer delivery of local anesthetics. Dr. Masters is on the editorial board of the journal *BioTechniques*. Dr. Masters has mentored many students and fellows. He is an adjunct assistant professor at the University of Minnesota (Minneapolis), where he



developed courses in polymeric drug delivery and biopharmaceutics. Dr. Masters is married to Linda K. Hansen, an assistant professor in the department of laboratory medicine at the University of Minnesota .

### **MARK R. MATHEWS, M.D.**

Dr. Mark Mathews was born in 1955 in Minneapolis, Minnesota, but grew up in Phoenix, Arizona. He received his B.S. and M.D. degrees at the University of Arizona College of Medicine. His first post-graduate year was spent as a transitional intern with the Tucson Hospital's Medical Education Program. He completed his anesthesiology residency training at the University of Minnesota and then became a fellow in neuroanesthesia at the Barrow Neurological Institute in Phoenix, Arizona. In 1989, Dr. Mathews was appointed senior associate consultant in anesthesiology with Mayo Clinic Scottsdale. In 1991, Dr. Mathews left the Mayo Clinic to become a founding member of a private practice group in Scottsdale, Arizona. In addition to providing clinical anesthetic services, Dr. Mathews is actively involved with the governing board of his group and also serves as chair of the department of anesthesiology at Scottsdale

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Healthcare, Shea. He currently resides in Scottsdale with his wife Kristin and their three children.

### **ROBERT D. MATHISON, M.D.**

Dr. Robert D. Mathison was born on Jan. 9, 1936, in Kasson, Minnesota. He attended Rochester Junior College from 1954 to 1956 and Antioch College, Yellow Springs, Ohio, from 1956 to 1958. He received the M.D. degree from the University of Minnesota (Minneapolis) in 1964. After general practice at the Columbia Park Clinic, Minneapolis, from 1964 to 1965 and at Annandale & Kimball, Minnesota, from 1965 to 1969, he entered the Mayo Graduate School of Medicine in 1970 as a fellow in anesthesiology. In 1976, he was appointed an assistant professor of anesthesiology in the Mayo Medical School. He resigned from the Mayo Clinic in 1977 to enter private practice. He and his wife Barbara have six children.



### **CHARLES FLETCHER McCUSKEY, M.D.**

Dr. Charles Fletcher McCuskey was born on Nov. 26, 1893, in Belton Marshall County, West Virginia. From 1913 to 1916, he attended the University of West Virginia (Morgantown) and from 1916 to 1918, the University of Tennessee, receiving the M.D. degree in 1918. After an internship in the U. S. Navy Medical Corps from 1918 to 1919, he was in private practice in Tennessee, West Virginia, and Washington, D. C. until 1924. In 1925, he became a special student in anesthesia at the Mayo Clinic, and in 1925, he was elected a member of the permanent staff of the Mayo Clinic. He was appointed an instructor in regional anesthesia. In 1933, Dr. McCuskey resigned from the Mayo Clinic to practice anesthesiology at Los Angeles, California, where he became an associate professor in the College of Medical Evangelists from 1933 to 1938. Dr. McCuskey became associate professor of anesthesia in the University of Southern California in 1939 and headed the department of anesthesia. During World War II (1939 - 1945), Dr. McCuskey was at Letterman General Hospital (San Francisco, California) from May 1942 to March 1945. He attained the rank of lieutenant colonel and was a senior consultant in anesthesiology for the U. S. Army in the Pacific area. Dr. McCuskey



was one of the original members of the Travel Club. He was chairman of the section of anesthesia of the American Medical Association in 1949, president of the American Society of Anesthesiologists (ASA) in 1948, and member (1940-1953) and president of the American Board of Anesthesiology (1948). In 1953, he received the distinguished service award from the ASA. Dr. McCuskey and his wife Gertrude had two children. Dr. McCuskey died on Jan. 24, 1980.

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### **BRIAN PATRICK McGLINCH, M.D.**

Dr. Brian Patrick McGlinch was born in Rochester, Minnesota, on Apr. 16, 1962. He attended St. John's University in Collegeville, Minnesota, and then the University of Minnesota Medical School in Minneapolis. Dr. McGlinch spent his internship year and his anesthesiology residency at the Mayo Graduate School of Medicine in Rochester. He was appointed an associate consultant in 1996 and a senior associate consultant in 1997. In April 1997, Dr. McGlinch was certified by the American Board of Anesthesiology. Dr. McGlinch married Pamela in 1988. They have three daughters.



### **DIANA G. McGREGOR, M.D.**

Dr. Diana McGregor was born in London, England. She graduated from King's College, University of London and Westminster Medical School in 1971. She completed her anesthesia residency training at Cambridge University in 1982. She was awarded the fellowship of the Royal College of Anaesthetists in 1977. From 1983 to 1984, she was assistant professor of anesthesiology at Stanford University, California. Thereafter, she was a consultant anaesthetist and director of obstetric anesthesia in Newcastle upon Tyne, England. In 1988, she joined the Mayo Clinic, Rochester. Currently, Dr. McGregor is an assistant professor of anesthesiology in the Mayo Medical School. Her interests and publications include obstetric anesthesia, regional anesthesia, preoperative evaluation, premedication in children, and the effect of trace anesthetic gases on operating room personnel. She serves on the American Society of Anesthesiologists committee



on occupational health, where she chairs the task force on trace anesthetic gases. She is married to Christopher McGregor, a Mayo Clinic cardiac surgeon. They have five children.

### **JOHN C. McMICHAN, M.D., Ph.D.**

Dr. John C. McMichan was born in Melbourne, Australia, on June 1, 1941. He received his medical education at Monash University in Clayton, Victoria, Australia, and received the M. B. B. S. degree in 1966. After commencing a surgical residency, he obtained the first part of the surgical fellowship in England before returning to Australia to enter the department of orthopaedics of Monash University, from which he obtained the Ph.D. degree in surgery in 1976. At the Mayo Clinic Rochester, he completed a fellowship in critical care medicine in 1977. He was appointed an associate consultant in 1977. He was certified by the American Board of Anesthesiology. He became a consultant at the Mayo Clinic in Rochester. Dr. McMichan has special interests in spinal cord injury, hemodynamic monitoring, and anesthesia for pediatric craniofacial reconstruction. He was the director of the critical care training program and was promoted to associate professor of anesthesiology in the Mayo School of Medicine. In 1987, with the opening of Mayo Clinic, Scottsdale, Arizona, he was



appointed head of section of anesthesiology, a position he held for 6 years. He was the course director of the first 10 annual Mayo Clinic *Current Topics in Anesthesiology* meetings in Scottsdale. He retired from clinical practice at the end of 1999. He is married to Janice Lewis.

### **WILLIAM R. MEEKER, M.D.**

Dr. William R. Meeker was born on June 2, 1889, in Hazel Dell, Illinois. He received the M.D. degree from Rush Medical College (Chicago) in 1920. He interned at the Cook County Hospital in Chicago, after which he became the medical director of the Little Rock Hospital and professor of pathology at the University of Arkansas. In 1921, Dr. Meeker was appointed head of section on regional anesthesia at the Mayo Clinic, a position he held until 1923. He then changed his specialty and began a residency in surgery at the Mayo Graduate School of Medicine, after which he practiced surgery in Chicago, Illinois, and in Mobile, Alabama. Dr. Meeker died on July 25, 1955.



### **JOSEPH M. MESSICK, JR., M.D.**

Dr. Joseph Messick, Jr., was born in Wilmington, Delaware, in 1935. He received the B. A. degree from Wesleyan University and the M.D. degree from the University of Virginia School of Medicine in 1961. Following completion of an internship and a residency in anesthesiology in Philadelphia (Pennsylvania) and 2 years of active duty with the U. S. Navy, Dr. Messick came to the Mayo Graduate School of Medicine for additional training in 1966. He was appointed a consultant in 1968 and received American Board of Anesthesiology certification that year. He served on various Mayo Clinic, departmental, and St. Marys Hospital committees and served the Minnesota Society of Anesthesiologists in various capacities, including as delegate to the American Society of Anesthesiologists and as president from 1977 to 1978. Dr. Messick was head of the neuroanesthesia group from 1978 to 1984 and chairman of the St. Marys' division of anesthesiology from 1984 to 1988. He established the acute pain service in 1989 and a fellowship in the management of pain in 1993 and served as direc-



tor of both and as chairman of the division of pain services until his retirement in 1997. He was honored as teacher of the year in 1988. Dr. Messick's first wife, Madison, died. He is married to Shelley, a Mayo Clinic neurologist, and has three children.

## JOHN D. MICHENFELDER, M.D.

Dr. John D. Michenfelder was born in St. Louis, Missouri, on Apr. 13, 1931. He received the M.D. degree from St. Louis University in 1955. After an internship and a residency in internal medicine at Presbyterian-St. Lukes Hospital in Chicago (Illinois) from 1955 to 1956, he served 2 years in the U. S. Navy, from 1956 to 1958. In 1958, he began a residency in anesthesiology at the Mayo Graduate School of Medicine and was appointed a consultant in 1961. His clinical practice was restricted to neurosurgical anesthesia, and in 1964, he was granted 50% time to pursue his research interests in cerebral blood flow and metabolism. This activity was supported by two National Institutes of Health grants from 1966 to 1989 and from 1991 to 1993. He was promoted to professor of anesthesiology in the Mayo Medical School in 1975. He served as head of neurosurgical anesthesia (1968-1975); head of St. Marys' section of anesthesia (1971-1975); and chairman of the division of anesthesia research (1987-1990). He served on the editorial board of *Anesthesiology* (1973-1979) and was editor-in-chief of *Anesthesiology* (1979-1985). Between 1979 and 1994, he served on the editorial board of seven other journals. He authored 190 scientific publications, including two books. Honors received



included election to FFARCS, Ireland (1982), FFARCS, England (1988), presentation of the 27th ASA Rovenstine Lecture (1988), recipient of the ASA Excellence in Research Award (1990), recipient of the ASA Distinguished Service Award (1991), recipient of the Anesthesia Foundation Best Book Award (1991), and election to the Institute of Medicine of the National Academy of Sciences (1990). He retired in 1993. He and his wife Monica reside in Oronoco (Minnesota).

## LESLIE NEWBERG MILDE, M.D.

Dr. Leslie Newberg Milde was born on Aug. 17, 1943, in Rochester, New York. She received the M.D. degree from the University of California, San Francisco, in 1977. She completed a residency in anesthesiology in 1980 and a fellowship in critical care medicine in 1981 at Massachusetts General Hospital, Harvard Medical School in Boston, Massachusetts, and a research fellowship in neuroanesthesia in 1982 at Mayo Graduate School of Medicine (Rochester). Dr. Milde joined the staff of the Mayo Clinic, Rochester, in 1982. She was promoted to professor of anesthesiology in the Mayo Medical School in 1993. Dr. Milde was certified by the American Board of Anesthesiology. She was named chair of the division of education within the department in 1990 and vice chair for education of the department in 1992. She joined the staff of Mayo Clinic Scottsdale, in 1994 and was named chair, department of anesthesiology at the Mayo Clinic Scottsdale, in 1997. Dr. Milde is recognized for her work in neuroanesthesia and brain protection. She has more than 120 scientific publications. She is an associate examiner for the American Board of Anesthesiology, a member



of the Association of University Anesthesiologists, and president of the Maricopa Society of Anesthesiologists. Dr. Milde is married to James H. Milde, who retired from the Mayo Clinic, Rochester, in 1994. They have four children and eight grandchildren and make their home in Scottsdale, Arizona, and Garrison, Minnesota.

### EMERSON A. MOFFITT, M.D.

Dr. Emerson Moffitt was born on Sept. 9, 1924, in McAdam, New Brunswick, Canada. After service in the Fleet Air Arm, Royal Navy, he graduated in 1951 from Dalhousie Medical School in Halifax, Nova Scotia. In 1954, he entered the Mayo Graduate School of Medicine as a fellow in anesthesiology. In 1958, he received the M. S. degree from the University of Minnesota (Minneapolis) and in 1957 was appointed a consultant. He published extensively on the pathophysiology of patients undergoing anesthesia for cardiac surgery. In 1960, he was certified by the American Board of Anesthesiology and in 1969 was promoted to associate professor of anesthesiology in the Mayo Graduate School of Medicine. Dr. Moffitt was head of section of anesthesiology at St. Marys Hospital (Rochester). He was president of the Minnesota Society of Anesthesiologists in 1967. Dr. Moffitt resigned from the Mayo Clinic in 1972 to become professor and head at Dalhousie Medical School. He was associate dean of clinical affairs at the medical school and associate editor of the *Canadian Journal of Anesthesia* from 1973 to 1982. Dr. Moffitt received many honors, including the Gold Medal of the Canadian Society, Citation of Achievement



of the International Anesthesia Research Society, Citation of Merit from the Academy of Anesthesiology, Distinguished Service Award from the Medical Society of Nova Scotia, and inclusion in *2000 Outstanding Scientists of the 20th Century*, by the International Biographical Centre (England) and in *1000 World Leaders of Influence*, by the American Biographical Institute.

### LLOYD H. MOUSEL, M.D.

Dr. Lloyd H. Mousel was born on Dec. 24, 1903, in Cambridge, Nebraska. In 1930, he received the M.D. degree from the University of Nebraska (Omaha). After his internship at Tacoma General Hospital in Tacoma, Washington, he practiced in McCook, Nebraska, and then in Cambridge, Nebraska, until 1936. He began a fellowship in anesthesiology at the Mayo Graduate School of Medicine in 1936. In 1939, he received the M. S. degree from the University of Minnesota (Minneapolis). Dr. Mousel was appointed a consultant in 1939 and was promoted to assistant professor of anesthesiology in the Mayo Graduate School of Medicine in 1945. He was certified by the American Board of Anesthesiology in 1940. From 1942 to 1946, he served in the Medical Corps of the U. S. Army. In 1946, he resigned from the Mayo Clinic and became chief of the department of anesthesiology of the George Washington University School of Medicine in Washington, D.C. He resigned from that post in 1951 to become the director of anesthesia at the Swedish



Hospital in Seattle (Washington), where he was appointed an associate professor of anesthesiology in the University of Washington School of Medicine. Dr. Mousel died on June 13, 1970.

### **JEFF T. MUELLER, M.D.**

Jeff T. Mueller, M.D., was born in Wichita, Kansas, on Dec. 31, 1963. After completing his B.S. degree in mechanical engineering at the University of Tulsa in 1986, he was a research engineer for 2 years with the Martin Marietta Aerospace Corporation in Denver, Colorado, examining low-gravity fluid mechanics and propulsion systems. He subsequently became a design engineer with Premier Pneumatics, Inc., staying 2 years with this company while completing a pre-medical undergraduate program. He obtained his medical education at Washington University in St. Louis, graduating in 1993. Coming to the Mayo Clinic, he initially did an internship for a year in internal medicine and then began an anesthesiology residency in Rochester and in Scottsdale, which he completed in 1997. That year, he was appointed a senior associate consultant at the Mayo Clinic in Scottsdale. Subsequently, he worked as an anesthesiologist in private practice in Central Kansas. In February 2000, he rejoined the con-



sultant staff of the department of anesthesiology at the Mayo Clinic in Scottsdale. Dr. Mueller is a member of the Tulsa University Mechanical Engineering Board of Advisors. He is married to Julie R. Mueller.

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### **JESSE J. MUIR, M.D.**

Dr. Jesse Muir was born on Nov. 30, 1949, in Kaufbeuren, Germany. He received his undergraduate training at the University of Nebraska, in Lincoln. He then attended the University of Nebraska Medical Center in Omaha and earned the M.D. degree in 1977. He served a combined internship-residency at the University of Nebraska Medical Center (Omaha). He was appointed a consultant at the Mayo Clinic in 1980. He was certified by the American Board of Anesthesiology in 1982, and he also received a certificate of added qualifications in pain management by the American Board of Anesthesiology in 1996. His current interests include the practice of anesthesiology and the management of pain. He is head of the section of the pain clinic at the Mayo Clinic Scottsdale, Arizona.



### **SHEILA M. MULDOON, M.D.**

Dr. Sheila Muldoon was born on July 6, 1935, in Kells, Ireland. She received the degree of M. B. B. Chir. from University College, Dublin, Ireland, in 1963. After an internship and postgraduate training in the Mater Hospital in Dublin, she entered the Mayo Graduate School of Medicine in 1966 as a resident in anesthesiology. Dr. Muldoon received the M. S. degree in anesthesiology and physiology from the University of Minnesota, Minneapolis; her advisor was Dr. Richard A. Theye. In 1969, Dr. Muldoon was appointed an assistant to the staff and was advanced to consultant in 1970. She was certified by the American Board of Anesthesiology in 1971, and in 1973, she was appointed an instructor of anesthesiology in the Mayo School of Medicine. Dr. Muldoon was awarded grants from the American Society of Anesthesiologists, the Minnesota Heart Association, and N.I.H. (National Institutes of Health) for studies aimed at defining the effects of general anesthetics on the sympathetic control of blood vessels. She worked with Drs. Paul Vanhoutte, Gertrude Tyce, and Duane Rorie on these projects. In 1977, Dr. Muldoon resigned from the Mayo Clinic.



Currently, she is professor of anesthesiology and chairperson of the department of anesthesiology at the Uniformed Services University of the Health Sciences in Bethesda, Maryland. Dr. Muldoon was married to the late Nicholas G. Nolan, a consultant at the Mayo Clinic in pathology and nuclear medicine, and is the parent of one daughter.

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### **JANICE LYNN MURRAY, M.D.**

Dr. Janice Lynn Murray was born on June 28, 1957, in Wiesbaden, Germany. She received her undergraduate education at the Loretto Heights College in Denver, Colorado, from 1979 to 1983. In 1983, she received the B. S. N. degree, after which she attended Tufts University School of Medicine in Boston, Massachusetts, and was awarded the M.D. degree in 1987. Between 1979 and 1987, she worked as a staff nurse in various locations. After her internship at the Faulkner Hospital in Boston, she served, from 1988 to 1991, a residency in anesthesiology at Beth Israel Hospital and at Children's Hospital, both in Boston. From 1991 to 1992, she was a staff anesthesiologist with the Syracuse Anesthesia Group (Syracuse, New York). In 1992, she was appointed a senior associate consultant at the Mayo Clinic in Rochester. She resigned from the Mayo Clinic in 1993.



### **MICHAEL J. MURRAY, M.D., Ph.D.**

Dr. Michael Murray was born on Sept. 22, 1949, in Buffalo, New York. He received the B.S. degree in 1971 from St. Benedictine's College in Atchison, Kansas, where he played 4 years of collegiate basketball and subsequently served on the college's board of directors. He attended medical school at Baylor College of Medicine in Houston, Texas, and earned the M.D. degree in 1976. In 1977, he earned the Ph.D. degree from Baylor College of Medicine in Houston, Texas. He served residencies at the Mayo Graduate School of Medicine and LDS Hospital in Salt Lake City, Utah, in anesthesiology, internal medicine, and critical care. He worked as a general medical officer at the Indian Health Service Hospital in Cass Lake, Minnesota, as a family physician in Bemidji, Minnesota, and as chief of internal medicine at Texas Tech's Health Science Center in Amarillo, Texas. In 1986, he was appointed a consultant at the Mayo Clinic, and currently, he holds the rank of professor of anesthesiology in the Mayo School of Medicine. He is the Dean of the Mayo School of Health-Related Sciences. He is an examiner for the American Board of Anesthesiology, the American Board of Internal Medicine, and the National Board of Medical Examiners. He has coauthored several textbooks



including *Critical Care Medicine; Perioperative Management* and the third edition of *Clinical Anesthesia*. He is the director of the department's biochemistry and pharmacology research laboratory supported by the National Institutes of Health and industry-sponsored grants. Dr. Murray has served as president of the Zumbro Valley Medical Society, the Minnesota Medical Association, and the American Society of Critical Care Anesthesiologists.

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### **DONALD A. MUZZI, M.D.**

Dr. Donald A. Muzzi was born on Feb. 2, 1955, in Scranton, Pennsylvania. He attended the University of Pittsburgh (Pennsylvania) from which he received the B.S. degree in 1977. In 1976, he matriculated at the University of Pittsburgh School of Dental Medicine, and from 1980 to 1984, he attended the School of Medicine of the University of Pittsburgh. He received the D.M.D. degree in 1980 and the M.D. degree in 1984. He was a resident in anesthesiology at Mercy Hospital in Pittsburgh from 1984 to 1987. He entered the Mayo Graduate School of Medicine as a fellow in neuroanesthesia. He was appointed a senior associate consultant in 1988 and a consultant in 1991 at the Mayo Clinic, Rochester. He resigned from the Mayo Clinic in 1993. Currently, he is chief anesthesiologist at St. Mary's Hospital in Duluth, Minnesota.



### **BRADLY J. NARR, M.D.**

Dr. Bradly J. Narr was born on July 26, 1954, in Neosho, Missouri. He attended the University of Minnesota College of Biological Sciences (Minneapolis), from which he received the B.S. degree in biochemistry in 1976. He studied medicine at the University of Minnesota School of Medicine (Minneapolis), where he obtained the M.D. degree in 1980. After receiving the M.D. degree, he entered the Mayo Graduate School of Medicine, where he completed his internship in internal medicine in 1981 and continued to complete his residency in internal medicine and anesthesiology in 1985. He was appointed a consultant of anesthesiology in 1985 and was promoted to assistant professor of anesthesiology in the Mayo School of Medicine in 1991. Dr. Narr was appointed vice chair of anesthesiology clinical practice in 1998. Dr. Narr served from 1992 as medical director of respiratory therapy and from 1995 to 1998 as director of critical care service. Dr. Narr's most recent interest has been in the establishment of the Mayo preoperative evaluation center, where he serves as medical director. Dr. Narr was certified by the American Board of Internal Medicine in 1983, the American



Board of Anesthesiology (ABA) in 1986, and the ABA and Internal Medicine, Critical Care Medicine Board in 1989. Dr. Narr was named clinician of the year for the department of anesthesiology at the Mayo Clinic in 1995 and 1996 and teacher of the year for the nurse anesthesia program in 1996. Dr. Narr is married and has four children.

### **LEE A. NAUSS, M.D.**

Dr. Lee A. Nauss was born on Mar. 28, 1932, in Estherville, Iowa. During the Korean War, he served 2 years in the U. S. Army Medical Corps. He then attended a school of nursing and received the R. N. diploma in 1958. After graduation with a C. R. N. A. diploma, he moved to Juneau, Alaska, where he started an anesthesia department at St. Anne Hospital. He attended college at La Sierra in Riverside, California, from 1965 to 1966 and at Little Rock University (Arkansas) from 1966 to 1967. In 1967, he was admitted to medical school at the University of Arkansas in Little Rock, graduating with Alpha Omega Alpha honors in 1971. After completing a 1-year rotating internship at the University of Arkansas, he served residencies at Virginia Mason Hospital and at the Mayo Graduate School of Medicine. In 1974, he became a consultant at the Mayo Clinic Rochester, where he developed a program for treatment of chronic pain at the Rochester Methodist Hospital, which



later became the pain clinic. He received the Teacher of the Year Award in 1979 and 1995. Dr. Nauss retired from the Mayo Clinic in 1997 and lives with his wife Maria in Mazeppa, Minnesota.

### **DAVID O. NELSON, M.D.**

Dr. David O. Nelson was born in Bismarck, North Dakota, on Apr. 8, 1943. He received the M.D. degree from the University of Minnesota (Minneapolis) in 1969 and completed an internship at the University of Iowa (Iowa City) in medicine and pediatrics, a residency in anesthesiology at the University of Minnesota (Minneapolis), and a fellowship in anesthesiology at the Mayo Graduate School of Medicine (Rochester). After 2 years of active duty with the U. S. Air Force, he joined the staff of the Mayo Clinic as a consultant in 1974 and was appointed an assistant professor of anesthesiology. In 1980, Dr. Nelson entered private practice in St. Paul, Minnesota, with special interests in ambulatory anesthesia and interventional pain medicine. He received his certification by the American Board of Anesthesiology in 1975 and was certified by the American Board of Pain Medicine in 1995. Currently, he practices full-time interventional pain medicine with Medical Advanced Pain

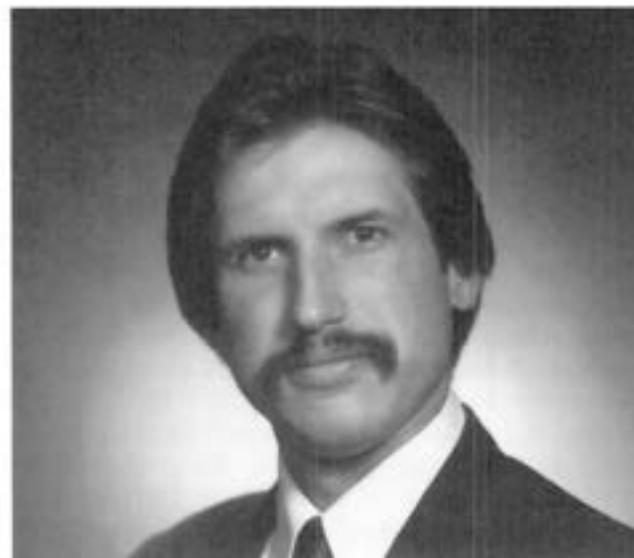


Specialists in the Twin Cities (Minnesota) and is a member of the American Academy of Pain Medicine and the International Spinal Injection Society. He is married to Maxine (Grossland) Nelson, and they have four children.

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### **CARL RICHARDSON NOBACK, M.D.**

Dr. Carl Richardson Noback was born on Aug. 7, 1951, in New York, New York. After his undergraduate education was completed at Yale University in New Haven, Connecticut, he attended the University of Missouri-Kansas City School of Medicine from 1973 to 1977, where he earned the M.D. degree. He interned at St. Lukes Hospital in Kansas City (Missouri) from 1977 to 1978 and then entered the Mayo Graduate School of Medicine as a resident in anesthesiology. In 1980, he was appointed a consultant at the Mayo Clinic and an instructor of anesthesiology in the Mayo Medical School. He is certified by the American Board of Anesthesiology. In March 1981, he resigned from the Mayo Clinic. Currently, he resides in Henderson, Nevada.



### **MICHAEL NUGENT, M.D.**

Dr. Michael Nugent was born on June 24, 1943, in Chico, California. His undergraduate education was at the University of California in Davis, the University of the Pacific in Stockton, and Stanford University in Palo Alto, California. From 1974 to 1977, he studied medicine at the University of Arizona in Tucson and received the M.D. degree in 1977. In 1977, he entered the Mayo Graduate School of Medicine as an intern, and later, he became a resident in anesthesiology. In 1980, Dr. Nugent was certified by the American Board of Anesthesiology. Dr. Nugent was appointed to the staff of the Mayo Clinic in 1981. He achieved the rank of associate professor of anesthesiology in the Mayo Medical School. Dr. Nugent resigned from the Mayo Clinic in 1989 and became professor and chairman of the department of anesthesiology at the Medical College of Ohio in Toledo.



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### **GREGORY A. NUTTALL, M.D.**

Dr. Gregory A. Nuttall was born on Mar. 19, 1960, in Minneapolis, Minnesota. He attended St. Olaf College in Northfield, Minnesota, and obtained the M.D. degree at the Mayo Medical School (Rochester) in 1986. He completed his residency in anesthesiology in 1990, with 1 year of fellowship in cardiac anesthesia at the Mayo Graduate School of Medicine and 2 months of pediatric anesthesia at the Children's Hospital in Washington, D. C. From 1990 to 1993, Dr. Nuttall served as a staff anesthesiologist for the U. S. Air Force in Anchorage, Alaska, and attained the rank of major. He returned to the Mayo Clinic as a senior associate consultant and an instructor in anesthesiology in the Mayo School of Medicine in 1993. He was promoted to associate professor of anesthesiology and to consultant in anesthesiology in 1996. Dr. Nuttall was certified by the



American Board of Anesthesiology in 1991. He is married and has three children.

### **MICHELLE A. O. KINNEY, M.D.**

Dr. Michelle Annette Ochs Kinney was born in Woodland, California, on Feb. 19, 1965. She received the M.D. degree from the University of Iowa College of Medicine (Iowa City) in 1994. She entered the Mayo Graduate School of Medicine in 1994 and completed an internship in preliminary internal medicine, a residency in anesthesiology, and a fellowship in pain management. She was appointed a senior associate consultant in 1999.



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### **WILLIAM C. OLIVER, JR., M.D.**

Dr. William C. Oliver, Jr., was born on Jan. 28, 1956, in Panama City, Florida. He attended the University of Alabama in Tuscaloosa, where he received the B.S. degree in chemistry and mathematics. He attended medical school at the University of Alabama School of Medicine in Birmingham. In 1983, Dr. Oliver entered the Mayo Graduate School of Medicine and completed his residency in anesthesiology in 1987. Dr. Oliver served as chief resident in anesthesiology from 1986 to 1987. Dr. Oliver was appointed a senior associate consultant in 1987 and a consultant in 1990. He was promoted to assistant professor of anesthesiology in the Mayo Medical School in 1992. Dr. Oliver is a member of the division of cardiovascular and thoracic anesthesia and has a particular interest in pediatric cardiac anesthesia, as well as in coagulation and



transfusion for cardiac surgery. His wife is Marge.

### **JOHN E. OSBORN, M.D.**

Dr. John E. Osborn was born on Aug. 11, 1919, in Wolcott, New York. He received the B. A. degree from Syracuse University, Syracuse, New York, in 1940 and the M.D. degree from the University of Buffalo, Buffalo, New York, in 1943. Dr. Osborn interned at the Rochester General Hospital (New York) in 1944. Thereafter, he entered the Mayo Graduate School of Medicine in 1944 as a fellow in anesthesiology. His training was interrupted by U. S. Army service during the World War II (1939-1945). He returned to the Mayo Clinic in 1948 and was appointed a consultant in 1949. In 1956, he became an instructor of anesthesiology in the Mayo Graduate School of Medicine. He and his wife Agnes had four children. One of their sons, Stephen, is the chief nurse anesthetist at the Mayo Clinic and their son Michael is a consultant in cardiology at the Mayo Clinic. Dr. Osborn died on July 30, 1957.



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### **ROBERT THORNTON PATRICK, M.D.**

Dr. Robert Thornton Patrick was born on Aug. 29, 1920, in Des Moines, Iowa. He graduated from Denison University (Ohio) and then attended medical school at the University of Louisville (Kentucky), earning the M.D. degree in 1944. From 1944 to 1946 and again from 1953 to 1954, he served in the U. S. Navy. He was in private practice from 1946 to 1949 in Norwalk, Ohio. In 1949, he entered the Mayo Graduate School of Medicine as a fellow in anesthesiology. In 1952, he was appointed a consultant. He was certified by the American Board of Anesthesiology (ABA). At the Mayo Clinic, Dr. Patrick anesthetized the first patients undergoing open-heart surgery performed by Dr. John W. Kirklin. Dr. Patrick resigned from the Mayo Clinic in 1961 and moved to Casper, Wyoming, where he became the city's first anesthesiologist. He remained in Casper until his retirement in 1985, with only a short interruption in the 1960s, when he was a faculty member of the University of California Medical School in Davis. Dr. Patrick was a director of the



ABA, serving also as vice president and secretary of the ABA in 1971. For many years, he was a member of the Wyoming State Board of Medicine. He was married to Dorothy Ann, and they had six children. Dr. Patrick died on Aug. 30, 1999.

### **JOHN A. PAULSON, M.D.**

Dr. John A. Paulson was born on Oct. 24, 1908, in Rochester, Minnesota. He attended Rochester Junior College and received the M.D. degree from the University of Minnesota (Minneapolis) in 1937. After an internship at Swedish Hospital in Minneapolis, from 1936 to 1937, he entered the Mayo Graduate School of Medicine in 1942 as a fellow in anesthesiology. His training was interrupted by military service in the U. S. Navy from 1942 to 1946. After his service, he returned to the Mayo Clinic. In 1947, he received the M. S. degree from the University of Minnesota. In the same year, he was appointed a consultant at the Mayo Clinic. For many years, he worked in anesthesia for orthopedic surgery at St. Marys Hospital (Rochester) and was active in the nurse anesthesia training program. Dr. Paulson retired from the Mayo Clinic in 1972. Dr. Paulson died on May 15, 1994.



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### **JOHN WILLIAM PENDER, M.D.**

Dr. John William Pender was born on Sept. 3, 1912 in Hesterville, Mississippi. He received the M.D. degree from Tulane University (New Orleans) in 1935. After 3 years of general practice, he began a fellowship in anesthesiology in the Mayo Graduate School of Medicine in 1940. After active duty in the U.S. Navy Reserves, from 1942 to 1946, Dr. Pender became a consultant at the Mayo Clinic in 1946 and an instructor of anesthesiology in 1947. In 1954, he left the Mayo Clinic to become head of the department of anesthesiology at the Palo Alto Medical Clinic and assistant professor of anesthesiology at Stanford University (California). Dr. Pender served as associate editor of *Anesthesiology* from 1956 to 1965 and was a member of the board of trustees of the Wood Library Museum, Chicago (Illinois) from 1969 to 1978. He served as chairman of the section on anesthesia of the American Medical Association in 1970 and 1971, was president of the Academy of Anesthesiology in 1965, and was



trustee of Audio-Digest Foundation from 1961 to 1971. He became emeritus professor of clinical anesthesiology at Stanford University in 1977. He and his late wife Catherine have six children.

### **WILLIAM J. PERKINS, M.D.**

Dr. William J. Perkins was born in Centralia, Washington, on Mar. 9, 1954. He attended Washington State University (Pullman) for his undergraduate degree, majoring in biochemistry and classical languages, graduating summa cum laude and as a member of the Phi Kappa Phi and Phi Beta Kappa societies. He attended medical school at the University of Washington (Seattle), graduating with honors and receiving the Van Citter award for research excellence (1985). Residency training in anesthesiology was obtained at the Mayo Graduate School of Medicine from 1985 to 1989. Dr. Perkins joined the department of anesthesiology at Oregon Health Sciences University (Portland) in 1989 and obtained a joint appointment with the department of neurosurgery in 1990. He returned to the department of anesthesiology at the Mayo Clinic in Rochester in 1992, specializing in the care of neurosurgical patients. His research interests include the effects of nitric oxide on smooth muscle function and on clinical



outcomes in neurosurgical patients undergoing carotid endarterectomy. He has served the American Board of Anesthesiology as an examiner from 1994 to the present. He is married to Cydney Yvonne and has one son, Andrew Cole.

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### **LAWRENCE B. PERRY, M.D.**

Dr. Lawrence B. Perry was born on May 12, 1927, in Ossining, New York. He attended Dartmouth College, Hanover, New Hampshire, and received the A. B. degree in 1950. In 1953, he earned the M.D. degree from the University of Vermont College of Medicine (Burlington). After 7 years of general practice, Dr. Perry served a residency in anesthesiology at Walter Reed General Hospital in Washington, D. C. In 1970, Dr. Perry was appointed a consultant at the Mayo Clinic Rochester, where he served as director of obstetric anesthesia from 1977 to 1986. He was prominent in the nurse anesthesia education program. Dr. Perry retired from the Mayo Clinic in 1987.



### **MICHAEL S. PETTIS, M.D.**

Dr. Michael S. Pettis was born on May 13, 1956. He entered the Mayo Graduate School of Medicine in 1985 as a resident in anesthesiology. In 1989, he was appointed a senior associate consultant. Dr. Pettis was certified by the American Board of Anesthesiology. In 1990, he resigned from the Mayo Clinic.



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### **WILLIAM JAMES PHILLIPS, M.D.**

Dr. William James Phillips was born on Feb. 9, 1959, in Jackson, Mississippi. In 1982, he earned the B. A. degree in biology and chemistry from the University of Virginia (Charlottesville). He then attended the University of Mississippi School of Medicine (Jackson) and received the M.D. degree in 1986. He interned in internal medicine from 1986 to 1987 at the University of Mississippi Medical Center in Jackson, Mississippi, and then began his residency in anesthesiology at the same institution. In 1990, he entered the Mayo Graduate School of Medicine, having a fellowship in pain management and regional anesthesia. He was certified by the American Board of Anesthesiology in 1991 and in pain management in 1993. In 1991, he became a staff anesthesiologist at the Walter Reed Army Medical Center (Washington, D. C.), and in 1993 he was a staff anesthesiologist at the Womack Army Medical Center in Fort Bragg (North Carolina). He was appointed a senior associate consultant in 1995



and a consultant in 1999 at the Mayo Clinic in Rochester. Dr. Phillips served as head of the pain clinic. In 1997, he resigned from the Mayo Clinic to enter a residency in emergency medicine at the University of Mississippi in Jackson.

### **DAVID J. PLEVAK, M.D.**

Dr. David Plevak was born on Jan. 16, 1953, at Castle Air Force Base, California. He received his education at Marquette University and the Medical College of Wisconsin in Milwaukee, Wisconsin. He completed an internship and residencies in internal medicine and in anesthesiology at the Mayo Clinic. He joined the staff of the Mayo Clinic as a consultant in 1984, and since that time, he has been active in critical care medicine and providing anesthesia in the operating suite. Specifically, he has led the efforts of the Mayo Clinic in the critical care management of patients with liver disease and provides anesthesia for these patients when they undergo liver transplantation. In addition, for many years, he has been the medical director of the respiratory therapy education program conducted jointly by the Mayo Clinic and Foundation and the Rochester Community College. He also has been instrumental in establishing an ongoing program that examines spirituality in medicine.



Currently, he is a professor of anesthesiology in the Mayo School of Medicine. He has been honored four times as teacher of the year in critical care medicine. Dr. Plevak is married to Marisa and has four children.

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### **JAMES G. POSTON, M.D.**

Dr. James G. Poston was born on Nov. 23, 1946, in Kingsport, Tennessee. After his undergraduate education at the Wake Forest University in Winston-Salem, North Carolina, he attended the University of Tennessee Medical School in Memphis from 1968 to 1971 when he received the M.D. degree. Dr. Poston interned at the Children's Medical Center in Dallas, Texas, from 1971 to 1972. Between 1972 and 1978, he was a resident in pediatrics at Children's Medical Center in Dallas, Texas, and in anesthesiology at the University of Mississippi in Jackson, Mississippi, and at the Dartmouth-Hitchcock Medical Center in Hanover, New Hampshire. From 1974 to 1976, he was a staff pediatrician in the U. S. Air Force. He was certified by the American Board of Pediatrics in 1976 and by the American Board of Anesthesiology in 1979. In 1978, he was appointed a consultant at the Mayo Clinic, and in 1979, he was promoted to assistant professor of anesthesiology in the Mayo Medical



School. Dr. Poston resigned from the Mayo Clinic in 1980. Currently, he and his wife Traci reside in Wichita Falls, Texas.

### **KARL A. POTERACK, M.D.**

Dr. Karl A. Poterack was born in Grand Rapids, Michigan, on Mar. 25, 1961. He attended the University of Michigan (Ann Arbor), from which he received the B.S. degree in 1982 and the M.D. degree in 1985. He completed 2 years of a general surgical residency at the Medical College of Wisconsin in Milwaukee, Wisconsin, and then finished a residency in anesthesiology in 1990, and also did a 1-year fellowship in neuroanesthesia, all at the Medical College of Wisconsin. Dr. Poterack was certified as a Diplomate by the American Board of Anesthesiology in 1991. That same year, he entered the U. S. Air Force and served as a staff anesthesiologist at Wilford Hall Medical Center, Lackland Air Force Base, San Antonio, Texas, from 1991 to 1995. He was honorably discharged in 1995, with the rank of major. Dr. Poterack joined the faculty of the department of anesthesiology of the Medical College of Wisconsin in July 1995. He served as clinical director of the department of anesthesiology at Froedtert Memorial Lutheran Hospital, in Milwaukee, Wisconsin. He was promoted to asso-



ciate professor in 1997. Dr. Poterack was appointed a senior associate consultant at the Mayo Clinic Scottsdale (Arizona), in 1997. Dr. Poterack is married to Dr. Catherine Theodoulou Poterack. They have two children.

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### **JAMES A. PRENTICE, M.D.**

Dr. James A. Prentice was born on Jan. 22, 1937 in Brady, Texas. He received the M.D. degree from the University of Texas Southwestern Medical School in Dallas in 1962. After an internship at Hartford Hospital (Hartford), Connecticut, he served for 7 years in the U. S. Air Force Medical Corps, attaining the rank of major. During his military service, he completed a residency in anesthesiology at the National Naval Medical Center, Bethesda, Maryland. In 1970, Dr. Prentice was appointed a consultant at the Mayo Clinic in Rochester and an assistant professor of anesthesiology in the Mayo Medical School. He resigned from the Mayo Clinic in 1978 to practice anesthesiology with the Austin Anesthesiology Group (Austin, Texas). Dr. Prentice was certified by the American College of Anesthesiologists in 1968 and by the American Board of Anesthesiology (ABA) in 1972. He was a charter member of the Society of Cardiac Anesthesiologists, and while at the Mayo Clinic, he served as junior examiner for the ABA. In Austin, he has served as president of the Travis



County Medical Society and as president of the Texas Mayo Alumni Society. He and his wife Linda, who is a pediatrician, have three children. Both Dr. Prentice and his wife continue to practice in Austin, Texas.

### **MARIA N. PSOMAS, M.D.**

Dr. Maria Psomas is a native of Greece, where she currently resides in Athens. She completed a residency training in anesthesiology at the Mayo Clinic. She works each year for 2 months at the Mayo Clinic in Rochester as a senior associate consultant.



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### **HUGO S. RAIMUNDO, M.D.**

Dr. Hugo S. Raimundo was born in Pangim, Goa, India, on Feb. 13, 1937. He received his medical education at the Hospital de Sao Joao, Oporto, Portugal. In 1966, Dr. Raimundo completed a 1-year internship at the Robert Packer Hospital-Guthrie Clinic in Sayre, Pennsylvania. Dr. Raimundo entered a residency in anesthesia at the Mayo Graduate School of Medicine in 1972 and was appointed a consultant in anesthesiology that same year. He served as a member of the division of cardiovascular and thoracic anesthesiology. Dr. Raimundo is a Diplomate of the American Board of Anesthesiology. He retired in 1999.



## JUKKA RÄSÄNEN, M.D.

Dr. Jukka Räsänen was born in Lahti, Finland, on Sept. 26, 1952. He graduated from the University of Helsinki School of Medicine in 1978, completed a residency in anesthesiology at the University of Helsinki and a 2-year fellowship in anesthesiology/critical care at Ohio State University (Columbus), and became board certified in Anesthesiology in 1988, with special competency in pediatric anesthesiology awarded in 1999. Dr. Räsänen wrote his academic dissertation on the effects of positive pressure breathing in cardiorespiratory failure from acute myocardial infarction and received the M.D. degree from the University of Helsinki in 1987 and a docent degree in anesthesiology in 1993. He is the author of more than 100 publications on respiratory support in acute lung injury, monitoring of cardiorespiratory function, and artificial intelligence applications in anesthesiology and critical care medicine. After specialization, Räsänen served as staff anesthesiologist and director of pediatric critical care at Children's Hospital, University of Helsinki. In 1990, he joined the department of anesthesiology at the University of South Florida (Tampa) and served there as an



associate professor of anesthesiology and medical director of research until 1995, when he returned to the Children's Hospital pediatric intensive care unit, University of Helsinki. In 1997, Dr. Räsänen joined the department of anesthesiology at the Mayo Clinic. Currently, he is senior associate consultant and professor of anesthesiology with a joint appointment in the department of pediatrics.

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## KAI REHDER, M.D.

Dr. Kai Rehder was born on Dec. 17, 1928, in Hohenwestedt, Germany. In 1953, he received the M.D. degree from the University of Freiburg, Germany. After an internship at the University Pediatric Hospital in Freiburg, he became a fellow in the Mayo Graduate School of Medicine, serving from 1957 to 1961. After his fellowship, he was head of the section of anesthesia at the University of Wuerzburg, Germany, where his research team discovered biotransformation of halothane in humans. He became a consultant at the Mayo Clinic in 1966 and was promoted to professor of anesthesiology in 1976 and to professor of physiology in 1978 in the Mayo School of Medicine. His research interest included pulmonary mechanics, intrapulmonary inspired gas distribution, and pulmonary blood flow distribution. His research efforts were supported by N.I.H. (National Institutes of Health) grants throughout his career, and he was the principal investigator of the first Anesthesia Training Grant of the department. Dr. Rehder served on the editorial boards of *Journal of Applied Physiology*, *Anesthesiology*, and *News in Physiologic Sciences*. He was a member of N.I.H. study sections. His honors included H. V. Jones Award, Louis Mark Memorial Lecturer of the American College of



Chest Physicians, Distinguished Lecturer of Medical Sciences, Department of Medicine, Honorary Membership of the Belgian and German Societies of Anesthesiology, elected fellow of the Royal College of Anaesthetists, the Mayo Foundation Ruth and Vernon Taylor named Professorship, and the American Society of Anesthesiologists' Excellence in Research Award. He and his wife Bärbel have four sons. Dr. Rehder retired from the Mayo Clinic in 1991.

### **KENT H. REHFELDT, M.D.**

Dr. Kent H. Rehfeldt was born on Nov. 1, 1968, in Waverly, Iowa. He received his undergraduate degree in chemistry from St. Olaf College, Northfield, Minnesota, in 1991, and the M.D. degree from the University of Iowa College of Medicine (Iowa City) in 1995. Dr. Rehfeldt served as a transitional resident at the Gundersen Clinic-Lutheran Hospital in La Crosse, Wisconsin, from 1995 to 1996. Subsequently, he completed a residency in anesthesiology at the Mayo Graduate School of Medicine in Rochester and served as a chief resident from 1998 to 1999. In 1999, he was appointed a Mayo Foundation Special Clinical Scholar in cardiovascular anesthesiology and echocardiography. Dr. Rehfeldt was appointed an instructor of anesthesiology in the Mayo Medical School in 1999. He has been appointed a senior associate consultant, effective 2001.

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### **CHARLES C. RESTALL, M.D.**

Dr. Charles C. Restall was born on July 31, 1923, in Seattle, Washington. He served in the U.S. Army from 1943 to 1946. In 1950, he received the M.D. degree from the University of Tennessee (Memphis). After an internship at John Gaston Hospital, Memphis, from 1950 to 1951, he served in the U. S. Army Medical Corps. Dr. Restall was appointed a consultant in anesthesiology at the Mayo Clinic in 1959. In 1961, he was certified as Diplomate by the American Board of Anesthesiology. In 1970, he was promoted to assistant professor of anesthesiology. Dr. Restall had an extensive practice of caudal and spinal anesthesia for proctologic and urologic surgery, which he shared with generations of residents. Dr. Restall retired from the Mayo Clinic in 1987. He and his wife Frances had two children. He died on Aug. 14, 1994.



### **STEVEN R. RETTKE, M.D.**

Dr. Steven R. Rettke was born in Marinette, Wisconsin, on Oct. 22, 1946. He attended Western Michigan University (Kalamazoo) where he obtained the B.S. degree in aviation engineering. He enlisted in the U. S. Navy and served as a naval aviator with Attack Squadron 87, assigned to the USS Franklin D. Roosevelt (CVA-42). He continued his affiliation with the naval reserve, retiring with the rank of captain after 27 years of service. After his discharge from active duty, Dr. Rettke attended Jacksonville University (Jacksonville, Florida) obtaining the B.S. degree in biology. He then matriculated at the University of Wisconsin Medical School (Madison) and received the M.D. degree in 1979. Dr. Rettke completed a residency in anesthesiology at the Mayo Graduate School of Medicine in 1982 and joined the staff as a consultant. He was certified by the American Board of Anesthesiology in 1984. Dr. Rettke was instrumental in organizing and providing anesthesia support for the liver transplant program and is



presently the chair of Rochester Methodist Hospital north division of anesthesiology. He serves as a member of the board of visitors of Jacksonville University. He and his wife Mary have two children.

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### **EDWIN H. RHO, M.D.**

Dr. Edwin H. Rho was born in Cleveland, Ohio, on Sept. 13, 1968. He attended the University of Wisconsin Medical School (Madison) from which he received the M.D. degree in 1994. Dr. Rho entered the Mayo Foundation as a resident in anesthesiology on July 1, 1995. After completing the residency program in 1998, he continued as a fellow in obstetric anesthesiology. In June 1999, he was appointed a consultant and an instructor of anesthesiology in the Mayo Medical School. Dr. Rho was certified by the American Board of Anesthesiology in 1999. He is a member of the American Society of Anesthesiologists, the Minnesota Society of Anesthesiologists, and the Society of Obstetric Anesthesia and Perinatology.



### **ROGER W. RIDLEY, M.D.**

Dr. Roger W. Ridley was born on July 16, 1918, in Detroit, Michigan. He attended the University of Michigan and received the M.D. degree in 1943. After an internship, he joined the U. S. Army and was sent to Percy Jones Hospital (Battle Creek, Michigan), where he became known to Dr. Edward Tuohy. Dr. Ridley became a member of the 117th Evacuation Hospital and served 18 months in Europe. When he returned from Europe, Dr. Ridley went to Rochester, Minnesota, to join the Mayo Clinic at the insistence of Dr. Tuohy. Dr. Ridley was appointed to the anesthesiology staff in 1948. He became a Diplomate of the American Board of Anesthesiology in 1949. He received the M. S. degree in anesthesiology from the University of Minnesota also in 1949. Dr. Ridley served as a consultant in anesthesiology for 6 very stimulating and learning years. Dr. Ridley joined two other former Mayo Foundation fellows in the practice of the anesthesiology in Riverside, California. He retired in 1987. Dr. Ridley was an assistant professor of pharmacology at Loma



Loma Medical School (Loma Linda, California) and later was an associate clinical professor of anesthesiology at the same school. Dr. Ridley married Bessie Jane Root in 1942. They have five children and 17 grandchildren.

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### **NICKI D. RIPPETEAU, M.D.**

Dr. Nicki D. Rippeteau was born on Nov. 3, 1949. She was a resident in anesthesiology at the Mayo Graduate School of Medicine from 1977 to 1980. In 1981, she joined the staff of the Mayo Clinic. Dr. Rippeteau resigned from the Mayo Clinic in 1985.



### **THOMAS J. RODENBERG, M.D.**

Dr. Thomas J. Rodenberg was born in 1959 and was raised in New Ulm, Minnesota. He was an accomplished distance runner in high school and during his undergraduate years at the University of Kansas and was considered for the 1980 U.S. Olympic team at 5,000 meter. He received his M.D. degree from the University of Kansas in 1990. He then undertook a rotating internship and anesthesia residency at the University of Illinois Hospitals in Chicago. After this, he spent an additional year at this institution as a fellow in cardiothoracic anesthesia. In 1995, he did a fellowship in critical care medicine at the Mayo Clinic in Rochester and Jacksonville. Subsequently, he worked at Buffalo General Hospital and Temple University in Philadelphia before returning to the Mayo Clinic Jacksonville in 1998 to practice critical care medicine. He resigned from Mayo in 1999 to pursue his interest in cardiac and thoracic anesthesia in Lakeland, Florida.

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### **KEVIN P. RONAN, M.D.**

Dr. Kevin Ronan was born on Mar. 5, 1956. He was a resident in anesthesiology at the Mayo Graduate School of Medicine from 1987 to 1989. Dr. Ronan was appointed a senior associate consultant in 1990 and a consultant in 1993 at the Mayo Clinic Rochester. He resigned from the Mayo Clinic in 1994. Currently, he and his wife Patricia reside in Sioux Falls, South Dakota.



### **DUANE K. RORIE, M.D., Ph.D.**

Dr. Duane K. Rorie was born in Yellville, Arkansas, on Jan. 11, 1936. He received the Ph.D. degree in anatomy from the University of Mississippi in Jackson in 1964 and the M.D. degree from the University of Arkansas School of Medicine in Little Rock in 1970. Dr. Rorie came to the Mayo Graduate School of Medicine in internal medicine in 1970, transferring to anesthesiology in 1971. In June 1973, he was appointed a consultant in anesthesiology and an assistant professor of anesthesiology and anatomy. He advanced to associate professor in 1979 and professor in 1983. He was certified by the American Board of Anesthesiology in 1974. He was head of the section of anatomy from 1973 to 1980, chair of the division of anesthesiology at the Methodist Hospital in Rochester from 1980 to 1989, and chair of the department of anesthesiology from 1991 to 1999. He was appointed the first Reuben R. Eisenberg Professor in 1990. Dr. Rorie's research interests included neurotransmitter and



neuropeptide interactions with anesthetic agents at vascular neuroeffector junctions and the anatomical applications of regional anesthesia. He and his wife Carolyn have two children.

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### **STEVEN H. ROSE, M.D.**

Dr. Steven H. Rose was born on July 2, 1955, in St. Paul, Minnesota. He received the M.D. degree from Mayo Medical School in 1981. After 1 year of training in internal medicine at Mayo Graduate School of Medicine, he continued his postgraduate medical education at the Mayo Clinic in anesthesiology for 2 years. Dr. Rose was appointed a Mayo Foundation Scholar after his residency and completed additional training in Cape Town, South Africa, and London, England, before joining the department of anesthesiology in 1985. The American Board of Anesthesiology certified Dr. Rose as a Diplomate in 1986. Dr. Rose was involved in anesthesiology education in various roles throughout his career. He has served as department vice-chair for education from 1994 to the present and received the distinguished clinician award in 1993 and distinguished educator award in 1995 and 1999. In 1991, Dr. Rose married Dr. Beth A. Elliott, who is



also a member of the department of anesthesiology at the Mayo Clinic. They have two children, Sarah and Matthew.

### **MALCOLM S. SANDERS, M.D.**

Dr. Malcolm S. Sanders was born on Feb. 23, 1961 in Worcester, Massachusetts, and grew up in the small town of West Boylston located in the center of the state. After graduating from high school, he attended Boston University (Boston) for undergraduate studies and then transferred to Clark University (Worcester, Massachusetts) to complete his bachelor's degree. He worked part-time as a medical laboratory technician in the neonatal intensive care unit at Memorial Hospital while in Worcester. He then attended the Medical College of Wisconsin (Milwaukee) and was subsequently accepted into the internal medicine program at the Mayo Graduate School of Medicine. After completing his medical training, he elected to pursue further instruction in anesthesia and was accepted into the residency program at the Mayo Clinic. He has now been on staff in the department of anesthesiology for a lit-



tle more than 2 years. He and his wife Lee Ann have a son, John William.

### **PAULA J. SANTRACH, M.D.**

Dr. Paula J. Santrach was born in Grand Rapids, Minnesota, in 1955. She received the B.A. degree from Carleton College in Northfield, Minnesota, in 1977, and worked in the allergic diseases research laboratory at the Mayo Clinic from 1977 to 1980. In 1980, she entered the University of Minnesota, Minneapolis, and received the M.D. degree in 1984. Her postgraduate training included a residency in anatomic and clinical pathology at the University of North Carolina at Chapel Hill, where she was a co-chief resident. From 1988 to 1990, she was a fellow in transfusion medicine at the Mayo Clinic and became a consultant in the division of transfusion medicine, department of laboratory medicine and pathology, in 1990. At that time, she was also appointed co-director of the hospital clinical laboratories in the departments of anesthesiology and laboratory medicine and pathology. In 1995, she became the director of the intraoperative autotransfusion team. In 1998, she assumed responsibility for vascular access services and laboratory services (phlebotomy). She is certified by the American Board of Pathology in transfusion medicine as well as in anatomic and clinical pathology. Currently, she works with members of the



department of anesthesiology to provide rapid, clinically useful laboratory services in the operating room and intensive care unit settings. Her interests, beside coagulation testing, include laboratory markers of cardiac injury, blood conservation, and perioperative transfusion strategies. She is a member of the transfusion, coagulation, and cardiopulmonary bypass research group.

### **NORBERT SCHNELLE, M.D.**

Dr. Norbert Schnelle was born on Mar. 2, 1922, in Berlin, Germany. He received the M.D. degree from the University in Mainz (Germany) in 1951. He interned and then practiced medicine in Canada from 1954 to 1957. Dr. Schnelle entered the Mayo Graduate School of Medicine in 1957 and received the M. S. degree in anesthesiology from the University of Minnesota (Minneapolis) in 1960. In the same year, he was appointed a consultant in anesthesiology. In 1970, Dr. Schnelle became an assistant professor of anesthesiology in the Mayo Graduate School of Medicine. Dr. Schnelle introduced the scavenging of anesthetic gases in the operating room at the Mayo Clinic and had a keen interest in the management of patients with insulinomas and in diagnostic and therapeutic nerve blocks. Dr. Schnelle and his wife Hannalise have three children. Dr. Schnelle retired from the Mayo Clinic in 1986.



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### **RICK S. SCHWETTMANN, M.D.**

Dr. Rick S. Schwettmann was born on June 27, 1944, in San Antonio, Texas. He attended the University of Texas in Austin and received the B.A. degree in 1965. In 1969, he earned the M.D. degree from the Southwestern Medical School in Dallas, Texas. After completing an internship at the Dallas Veterans Administration Hospital, he began a residency in anesthesiology at the University of Washington in Seattle in 1970. Dr. Schwettmann held three teaching positions. The first one was at the Walter Reed Army Hospital in Washington, D. C., from 1973 to 1975. The second one was as a consultant at the Mayo Clinic and an assistant professor of anesthesiology in the Mayo Medical School. While at the Mayo Clinic, he received the teacher of the year award. His special interests were teaching regional anesthesia and working in the pain clinic. The third teaching position was as an associate professor at the University of Wisconsin (Madison) from 1977 to 1984. In 1984, he resigned from the University



of Wisconsin and began private practice in Amarillo, Texas. In 1991, he relocated to Denver, Colorado, where he practices pain medicine. He and his wife Betty have one child.

### **KENNETH PAUL SCOTT, M.D.**

Dr. Kenneth Paul Scott was born on Nov. 15, 1958, in Butte, Montana. He earned his undergraduate degree from the Montana State University, Bozeman, Montana. In 1982, he entered medical school at the University of Southern California, Los Angeles. After completing an internship in surgery at the University of North Dakota (Grand Forks), Dr. Scott began his residency in anesthesia at the Mayo Graduate School of Medicine in 1987. He joined the staff as a senior associate consultant in 1990 and was promoted to consultant in 1993.



### **DAVID SEAMANS, M.D.**

Dr. David Seamans was born in the Panhandle of Texas on Nov. 22, 1953. Shortly thereafter, his family emigrated to Denver, Colorado, where he spent his formative years. Another move to the East Coast predated high school and eventually led to post-secondary training at Amherst College in Massachusetts, where he received a B.S. in biology in 1976. Following 2 years of teaching high school science and mathematics, he pursued an athletic career as a squash professional in New York and Detroit, Michigan, where he taught and played on the fledgling World Professional Squash Association Tour. Following this, he completed a masters degree in kinesiology at the University of Michigan, which led to his pursuit of a medical career. He received his M.D. from Wayne State University in Detroit, Michigan, and came to the Mayo Clinic for his subsequent internship and residency in anesthesiology and fellowship in pain management. After completing his training, he took a position in the



anesthesia department at Mayo Clinic Scottsdale. He and his wife, Jane, and their three boys, Graham, D.J., and Will, reside in Scottsdale.

### THOMAS H. SELDON, M.D.

Dr. Thomas H. Seldon was born on Jan. 16, 1905, in Exeter, Ontario, Canada. He received the M.D. C. M. degree in 1929 from Queen's University, Ontario. From 1929 to 1930, he interned at Toronto Western Hospital and subsequently was engaged in private practice for 5 years. Dr. Seldon entered the Mayo Graduate School of Medicine in 1936. In 1940, he received the M. S. degree in anesthesiology from the University of Minnesota (Minneapolis). In the same year, he was appointed a consultant in anesthesiology at the Mayo Clinic. Dr. Seldon administered the early blood transfusion service at the Mayo Clinic. In 1963, Dr. Seldon was promoted to professor of anesthesiology in the Mayo Graduate School of Medicine. Dr. Seldon was a founder and later president of the Minnesota Society of Anesthesiologists. He was also president of the American Association of Blood Banks. Dr. Seldon served a long tenure as the editor-in-



chief of *Anesthesia and Analgesia*. Dr. Seldon retired from the Mayo Clinic in March 1970. He and his wife Lola had two children. He died on Oct. 22, 1991.

### ALAN D. SESSLER, M.D.

Dr. Alan D. Sessler was born on Apr. 4, 1932, in Boston, Massachusetts. He was graduated from the Boston Latin School in 1949, Dartmouth College with the A. B. degree in 1953, and Tufts Medical School with the M.D. degree in 1957. His internship and residency were at the Mary Hitchcock Memorial Hospital in Hanover, New Hampshire, from 1958 to 1959, after which he was a medical officer at the U. S. Naval Hospital, Great Lakes, Illinois and aboard the heavy cruiser U.S.S. Des Moines, from 1960 to 1961. Dr. Sessler entered a fellowship in anesthesiology at the Mayo Clinic in 1961 and was appointed a consultant in 1962. Intramurally, he improved the residency program, encouraged excellence in research, and extended the subspecialty practice, particularly in critical care as program director of the residency program, head of the section on respiratory intensive care, professor and chairman of the department, member of the board of governors and dean of the Mayo Graduate School of Medicine. Extramurally, he served the American Society of Anesthesiologists (ASA) as director, annual meeting chairman, and vice president for scientific affairs. He was secretary/treasurer and president of the American Board of Anesthesiology, an elected fellow of the Royal College of Anaesthetists of England and an honorary fellow of the Faculty of Anaesthetists of the



Royal College of Surgeons in Ireland. Dr. Sessler retired from the Mayo Clinic in 1995 and currently works with the ASA Foundations, Anesthesia Patient Safety Foundation, Wood Library Museum, and as executive director of the Foundation for Anesthesia Education and Research. He is a trustee of the Dartmouth Hitchcock Clinic, Mary Hitchcock Memorial Hospital, and the Dartmouth Hitchcock Medical Center (Lebanon, New Hampshire). He and his wife Martha, also an anesthesiologist, have three children.

### **TIMOTHY S. J. SHINE, M.D.**

Dr. Timothy S. J. Shine was born on Sept. 1, 1953, in Dublin, Ireland. He received his medical degree from Trinity College, Dublin, in 1979. Dr. Shine completed a residency in anesthesia at the Mayo Clinic Rochester, from 1980 to 1984. He then worked for 1 year at the Carle Clinic in Champaign-Urbana, Illinois, and returned to the Mayo Clinic in 1986. Under the guidance of Dr. Alan Sessler, Drs. Shine and James Harper were the first members to form the department of anesthesiology at the Mayo Clinic Jacksonville (Florida), in 1986. Dr. Shine is a Diplomate of the American Board of Anesthesiology and recently became board certified in perioperative transesophageal echocardiography by the National Board of Echocardiography. He and his wife Marsha have two children.



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### **GARY C. SIECK, Ph.D.**

Dr. Gary C. Sieck, born Oct. 19, 1948, in Seward, Nebraska, received the B.S. degree in zoology (1971) and the Ph. D. degree in physiology and biophysics (1976) from the University of Nebraska Medical Center (Omaha). He was in postdoctoral training at University of California, Los Angeles (UCLA) from 1976 to 1980, before joining the faculty at the City of Hope National Medical Center and the department of anatomy and cell biology at UCLA. In 1987, he joined the department of biomedical engineering at the University of Southern California, and in 1990, he joined the Mayo Clinic with a joint appointment in anesthesiology and physiology. He was named chair of the division of anesthesia research and vice chair for research of the department of anesthesiology, and director of the general clinical research center integrative physiology core laboratory. He serves as editor-in-chief of the *Journal of Applied Physiology* and on the editorial board of the *American Journal of Respiratory and Critical Care Medicine*. He also served on the board of directors of the American Thoracic Society, the National Council of the American Lung Association, the Respiratory and Applied Physiology Study Section at the National Institutes of Health (N.I.H.), and the Veterans Administration Merit Review Board for



Respiration. Dr. Sieck's research focuses on muscle physiology. He has studied neuromuscular plasticity, contractile protein expression, and excitation-contraction coupling. In airway and coronary artery smooth muscle, he has also examined cell signaling, intracellular calcium regulation, and mechanical coupling. In all these areas, he has been well funded by multiple grants from N.I.H. Dr. Sieck and his wife Joanne have two children.

### **J. CHRISTOPHER SILL, M.D.**

Dr. J. Christopher Sill was born on Jan. 20, 1950, in Yorkshire, England. He attended University College, London, and University College Hospital Medical School, receiving the M.B. B.S. degree in 1973. He entered the Mayo Graduate School of Medicine as a fellow in anesthesiology in 1978. He joined the faculty of the Johns Hopkins Hospital Medical School (Baltimore) in 1979 as an assistant professor of anesthesiology and returned to the Mayo Clinic in 1980, first as an assistant professor and then in 1990 as an associate professor of anesthesiology in the Mayo School of Medicine. Dr. Sill's research interests include the action of volatile anesthetics on vascular smooth muscle, work that has been supported by the National Institutes of Health. Dr. Sill is married to Cindy and has four children.

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### **RUNGSON SITTIPONG, M.D.**

Dr. Rungson Sittipong was born on July 16, 1941, in Chiang-Mai, Thailand. He attended the Chula Long Korn University in Bangkok, Thailand, from which he received the M.D. degree in 1965. After internships in Bangkok and Duluth, Minnesota, he entered the Mayo Graduate School as a fellow in physiology and anesthesiology in 1967. He was certified by the American Board of Anesthesiology in 1971 and was appointed a consultant in anesthesiology at the Mayo Clinic in 1972. He worked in this department from 1972 to his retirement in 1996, with only a brief absence. He received the Teacher of the Year Award from the Mayo Graduate School of Medicine in 1974 and 1986. Since retirement, Dr. Sittipong does volunteer work in teaching at the medical schools and anesthesia residency programs in Bangkok, Thailand.



### **B. TODD SITZMAN, M.D.**

Dr. B. Todd Sitzman was born in New Orleans, Louisiana, on Aug. 28, 1964. He graduated from Tulane University School of Medicine in New Orleans, Louisiana, in 1991 and received the M.P.H. degree from Tulane University School of Public Health and Tropical Medicine that same year. He served an internship in internal medicine at the Hospital of the University of Pennsylvania in Philadelphia, Pennsylvania, from 1991 to 1992, which was followed by residency training in anesthesiology at the University of Virginia in Charlottesville, Virginia, from 1993 to 1996. Dr. Sitzman came to the Mayo Clinic Jacksonville, in 1997 and was appointed a senior associate consultant in anesthesiology and pain management. In 1998, he was appointed an assistant professor of anesthesiology in the Mayo Medical School. Dr. Sitzman is the recipient of numerous awards and honors, including Tulane University School of Medicine's Chancellor's Scholarship (1986 -1991) and the Tulane's Kaplan Compassionate Physician Award (1991). In 1995, he received a Resident Scholar Award from the Foundation for Anesthesia Education and Research. In 1996, he received the American Society of Anesthesi-



ologists residents' research essay contest award and the University of Virginia's Gregg Korbon Award for Outstanding Resident in Clinical Research. Dr. Sitzman is a Diplomate of the American Board of Anesthesiology and the American Board of Pain Medicine. Currently, Dr. Sitzman lives in Jacksonville, Florida, with his wife Lisa Bartlett and their daughter, Olivia.

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### **PETER A. SOUTHORN, M.D.**

Dr. Peter A. Southorn was born on Aug. 30, 1941, in County Durham, United Kingdom. He received his undergraduate education at University College, London, and then attended University College Hospital Medical School, London. Prior to joining the Mayo Clinic in 1976, he was a consultant at the latter institution. He has been privileged to be involved in patient care and education in both the operating suites and intensive care units. His research interests initially focused on respiratory physiology and evolved into improving clinical practice. In his career, he has had the good fortune to also be involved in a variety of non-direct patient care activities. At the Mayo Clinic, these have included leading proposals to enhance patient monitoring and facilities, involvement in establishing transplant programs, and being active in both the Medical School and the Alumni Association. He has also represented his colleagues and associates in various state and national organizations.



Currently, Dr. Southorn is an associate professor of anesthesiology in the Mayo Medical School. He and his wife Wendy have three children.

### **KAREN CAMPBELL SPACCARELLI, M.D.**

Dr. Karen Campbell (Casey) Spaccarelli was born on Mar. 10, 1960, in Charleston, South Carolina. In 1982, she received the B.A. degree in biology from the University of California, San Diego, magna cum laude, and the M.D. degree from the University of California, Irvine, in 1986. She completed her residency in anesthesiology at the University of California, Los Angeles, in 1990, and then joined the staff of Mayo Clinic Scottsdale, in 1991 as an associate consultant. In 1991, she became a senior associate consultant and was advanced to consultant in 1994. In 1991, she became a Diplomate of the American Board of Anesthesiology. In 1994, she resigned from her positions as an instructor of anesthesiology in the Mayo Medical School and as a consultant in anesthesiology at Mayo Clinic Scottsdale, to move to Chicago, Illinois. In 1994, she was appointed a staff anesthesiologist at Illinois Masonic Medical Center in Chicago, Illinois; an assistant professor of anesthesiology at Rush Medical College in



Chicago; and, an assistant professor of anesthesiology at the University of Illinois in Chicago. She married Steven Spaccarelli in 1989. They have two children, Anthony and Laurel Anna.

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### **THOMAS N. SPACKMAN, M.D.**

Dr. Thomas N. Spackman was born on Oct. 11, 1949, in Edmonton, Alberta, Canada. He attended the University of Alberta, where he received the M.D. degree in 1976. Dr. Spackman served his internship at Edmonton General Hospital in 1977 and then joined a general practice in Cardston, Alberta, serving from 1977 to 1978. He entered the Mayo Graduate School of Medicine and completed a residency in the department of anesthesiology from 1978 to 1980. After joining a private practice in Pocatello, Idaho, serving from 1980 to 1982, Dr. Spackman returned to the Mayo Clinic and became an instructor of anesthesiology in the Mayo School of Medicine and a consultant in the department of anesthesiology. In 1988, he was promoted to assistant professor of anesthesiology. He received the M. S. degree in administrative medicine at the University of Wisconsin (Madison) in 1993. Dr. Spackman was chair of the division of cardiovascular/thoracic anesthesia from 1988 to 1996 and was appointed



vice-chair of regional practice in 1996. Dr. Spackman was certified by the American Board of Anesthesiology in 1983 and by the American Board of Medical Management in 1994. Dr. Spackman and his wife Susan have five children.

### **MARK S. SPERRY, M.D.**

Dr. Mark S. Sperry was born on Jan. 28, 1949, in Minot, North Dakota. He graduated from Minot State College, Minot, North Dakota, in 1971 with the B.S. degree in medical technology. He then attended the University of North Dakota Medical School in Grand Forks from 1971 to 1973. He completed his medical school education at the Medical College of Pennsylvania, Philadelphia, from 1973 to 1975, from which he received the M.D. degree. He completed a surgical internship at the Ohio State University Hospital, Columbus, Ohio, which was followed by a residency in surgery at the same institution. In 1977, he entered the Mayo Graduate School of Medicine as a resident in anesthesiology. In 1979, Dr. Sperry was appointed a consultant and an instructor of anesthesiology in the Mayo Graduate School of Medicine. He is certified by the American Board of Anesthesiology. Dr. Sperry resigned from the Mayo Clinic in 1981 and joined Midwest Anesthesiologists. He practices anesthesiology at Mercy and Unity hospitals in Minneapolis, Minnesota. He served as medical director of the Same Day Surgical Unit at Unity



Hospital from 1986 to 1995 and was president of Midwest Anesthesiologists from 1984 to 1995. Dr. Sperry received the M. S. degree in business administration from the University of St. Thomas in 1994. Dr. Sperry was elected chief of staff at Mercy Hospital from 2000 to 2002. He and his wife Vicki have three children.

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### **KURT EMIL SPRINGMANN, M.D.**

Dr. Kurt Emil Springmann was born on Feb. 7, 1955, in Milwaukee, Wisconsin. He was awarded the B.S. degree in 1976 and the M.D. degree in 1984 from the University of Arizona (Tucson). He served a surgical internship at the University of Arizona Affiliated Hospitals in Tucson, Arizona, from 1984 to 1985. In 1985, he began his training in anesthesiology at the University of Tucson. He joined the Mayo Clinic Scottsdale, in 1988 as a senior associate consultant. He resigned from the Mayo Clinic in 1989.



### **LEDA J. STACY, M.D.**

Dr. Leda J. Stacy was born on May 5, 1882, in Rochester, Minnesota. She received the M.D. degree from Rush Medical College in Chicago, Illinois in 1905. She interned at the Children's Hospital in San Francisco from 1905 to 1906, and then she was in private practice in Rochester until 1908. In 1908, she was appointed to the Mayo Clinic as an anesthesiologist. In 1910, she became an assistant in medicine. From 1915 to 1919, she was head of the section of radium therapy. She was promoted to associate professor of medicine. She resigned from the staff of the Mayo Clinic in 1935. Dr. Stacy died on May 30, 1973, in Princeton, New Jersey.



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### **WOLF H. STAPELFELDT, M.D.**

Dr. Wolf H. Stapelfeldt was born on June 7, 1958, in Bad Mergentheim, Germany. He attended the University of Ulm, Germany, where he was awarded the M.D. degree, summa cum laude, in 1984. Dr. Stapelfeldt entered the Mayo Foundation in Rochester, Minnesota in 1985, as a postdoctorate research fellow in physiology and was appointed an assistant professor of physiology and biophysics in the Mayo Medical School in 1989. Dr. Stapelfeldt completed graduate training in anesthesiology at the Mayo Clinic in 1992. Dr. Stapelfeldt then joined the University of Pittsburgh School of Medicine (Pittsburgh, Pennsylvania) and was appointed an assistant professor of anesthesiology and critical care medicine at the University of Pittsburgh School of Medicine and the Thomas E. Starzl Transplantation Institute in Pittsburgh, Pennsylvania, in 1993. He was certified by the American Board of Anesthesiology in 1993. Dr. Stapelfeldt rejoined the Mayo Clinic in 1998 as a



senior associate consultant in anesthesiology and anesthesiology director of the newly established liver transplant program at Mayo Clinic, Jacksonville, Florida. He is married to N. Marlena Jones.

### **KEITH L. STEIN, M.D.**

Dr. Keith L. Stein was born in Freeport, New York, on Sept. 21, 1957. He graduated magna cum laude from Rensselaer Polytechnic Institute (Troy, New York) and received the M. D. degree from Albany Medical College (Albany, New York) in 1980. He was certified by the American Board of Anesthesiology (ABA) in 1985 and received a certificate of special qualifications in critical care medicine from the ABA in 1987. Dr. Stein is a Fellow of the American College of Chest Physicians (FCCP) and the American College of Critical Care Medicine (FCCM). He has published extensively in the field of critical care medicine. Dr. Stein served as a consultant and an associate professor of anesthesiology and critical care in the Mayo School of Medicine, director of the intensive care units at St. Luke's Hospital, and chief of critical care medicine at the Mayo Clinic Jacksonville, between 1993 and 1996. Currently, he is vice president of medical



resource management at the Baptist/St. Vincent's Health System in Jacksonville, Florida. Dr. Stein is married to Cheryl Speier Stein, and they have two children.

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### **PAUL E. STENSRUD, M.D.**

Dr. Paul E. Stensrud was born on Apr. 20, 1961, in South Laguna, California, and was raised in Madison, South Dakota. He graduated from Augustana College, Sioux Falls, South Dakota, in 1983, with a major in biology and a minor in chemistry. He received the M.D. degree from the University of South Dakota School of Medicine (Vermillion) in 1987. His residency in anesthesiology was at the Mayo Graduate School of Medicine from 1987 to 1991. In 1991, he joined the department of anesthesiology at the Mayo Clinic as a senior associate consultant and was advanced to consultant in 1994. Dr. Stensrud's main interest is in cardiovascular and thoracic anesthesia, especially anesthesia for repair of congenital cardiac lesions. He is a member of Alpha Omega Alpha (1985), American Society of Anesthesiologists, International Anesthesia Research Society, and the Society of Cardiovascular Anesthesiologists. He and his



wife Judy, a certified registered nurse anesthetist, have one son, Andrew, born in 1998.

### **ROM ANTHONY STEVENS, M.D.**

Dr. Rom Anthony Stevens was born on Nov. 20, 1956, in Milwaukee, Wisconsin. He received M.D. degrees both from the University of Wisconsin Medical School (Madison) in May 1982 and from the University of Düsseldorf, Germany, in 1987. He served as a resident in anesthesiology at Baylor College of Medicine, Houston, Texas, and at the University of Colorado Health Sciences Center, Denver, Colorado. He also worked as a fellow in cardiovascular anesthesia and anesthesia research at the University of Düsseldorf. He received certification from the American Board of Anesthesiology in 1986, with added qualifications in pain management in 1994. Dr. Stevens was elected a member of the Anaesthetic Research Society (United Kingdom) in 1993. He is an associate editor of *Regional Anesthesia and Pain Medicine* and an editor of *Techniques in Regional Anesthesia and Pain Medicine*. He has published 40 peer-reviewed papers, 3 book chapters, and 50 scientific abstracts. Dr. Stevens was appointed a clinical associate professor of anesthesiology at the Uniformed Services University of the Health Sciences, Bethesda, Maryland, in 1994 and in 1998 an associate professor of anesthesiology at Mayo Clinic Jacksonville. Dr. Stevens was com-



missioned an ensign in the U. S. Naval Reserve in 1978. He holds the rank of captain (Medical Corps). He was awarded the Joint Services Commendation Medal and the Navy Achievement Medal. Dr. Stevens is married to Dr. Marianne Mikat-Stevens, formerly of Düsseldorf, Germany. They have three children, Natalie, Charlotte, and Leonardo.

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### **ROBERT A. STRICKLAND, M.D.**

Dr. Robert A. Strickland was born on Mar. 22, 1952, in Madison, Wisconsin. After graduating from the University of Kansas School of Medicine (Kansas City) in 1977, he completed a rotating internship at the Naval Aerospace and Regional Medical Center in Pensacola, Florida. He then became a flight surgeon in the U. S. Navy, serving for 2 years. Dr. Strickland received his training in anesthesia at Bowman Gray School of Medicine in Winston-Salem, North Carolina, and at the University of Alabama in Birmingham. He also completed a fellowship in critical care at Bowman Gray School of Medicine. Dr. Strickland is a Diplomate of the American Board of Anesthesiology and has a certificate of special qualifications in critical care. Dr. Strickland was in private practice in Springfield, Missouri, from 1984 to 1986. He was on the staff of the Mayo Clinic from 1988 to 1997. Currently, he is an anesthesiologist with Westport Anesthesia Services in Kansas City, Missouri, and is an asso-



ciate professor with the University of Missouri at Kansas City. He is married to the former Ellen Stegner, and they have a son, Matthew.

### **SAIT TARHAN, M.D.**

Dr. Sait Tarhan was born on Apr. 13, 1927, in Crimea of the former Soviet Union. At the age of 4 years, his family immigrated to Turkey and settled in Izmir. After graduating from Istanbul Medical School, he completed the training in pulmonology in Turkey and served in the Turkish Army in the cavalry division on the eastern front for 2 years. He came to the U. S. in 1958 and interned at St. Elizabeth Hospital and then worked at the W. Booth Memorial Hospital in Covington, Kentucky, and Cincinnati General Hospital until 1962. He came to Rochester for training in anesthesia in 1962 and joined the staff as a consultant in 1965. His specialty was cardiovascular anesthesiology in which he spent the remainder of his time. He was certified by the American Board of Anesthesiology in 1968 and served as head of the St. Marys Hospital section of anesthesiology from 1975 to 1983. He became a professor of anesthesiology in the Mayo Medical School in 1980. He served on numerous institutional and international committees and organizations. He received honorary memberships in the Japan Society of Anesthesiologists, the Japan Society for Clinical Anesthesia, the Turkish Society of Cardiovascular-Thoracic Anesthesia and Intensive Care, and the



Association of Anaesthesiologists and Reanimatologists of the Republic of Kazakhstan. He has received many awards, including the World Association of Cardio-Thoracic and Vascular Anesthesia Recognition Award for Outstanding Contributions as one of the Pioneers of Cardiovascular Anesthesia, and the Distinguished Mayo Clinician Award. He retired from the Mayo Clinic on June 30, 1997. Dr. Tarhan and his wife Linda have two children.

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### **HOWARD RICHARD TERRY, JR., M.D.**

Dr. Howard Richard Terry, Jr., was born on Aug. 10, 1923. He attended the Alabama Medical College (Birmingham) from 1941 to 1943 and the Long Island College of Medicine (New York) from 1945 to 1947, from which he received the M.D. degree. He interned at the U. S. Marine Hospital in Stapleton, New York, from 1947 to 1948. He then served a residency at South Highland Infirmary, Birmingham, from 1948 to 1949. After his residency, he was in private practice in Birmingham from 1949 to 1951. Thereafter, he became a senior assistant in the U. S. Public Health Service, serving from 1951 to 1953. He joined the Mayo Graduate School of Medicine in 1953 as a fellow in surgery and transferred to anesthesiology in 1954. In 1957, Dr. Terry was appointed a consultant at the Mayo Clinic. He was certified by the American Board of Anesthesiology in 1960. He and his wife Doreen



were parents of six children. Dr. Terry died in June 1991.

### **RICHARD A. THEYE, M.D.**

Dr. Richard A. Theye was born on May 22, 1923, in Fort Wayne, Indiana. He received the B.S. and the M.D. degrees from the University of Indiana (Bloomington). He interned at the Indiana University Medical Center. From 1952 to 1953, he was a resident at the same institution. After service in the U. S. Navy and private practice, Dr. Theye became a consultant in the section of anesthesiology at the Mayo Clinic. In 1967, he was promoted to a professor of anesthesiology in the Mayo Graduate School of Medicine. Dr. Theye was the first anesthesiology consultant to receive an assignment of dedicated research laboratory time. He was instrumental in the research training of Drs. John Michenfelder and Kai Rehder. He served as head of section of anesthesiology research from 1966 to 1973 and as chairman of the department of anesthesiology from 1971 to 1977. He served as a director of the American Board of Anesthesiology. Dr. Theye had a strong research interest in pulmonary gas exchange,



cardiac output, and regional oxygen uptake during anesthesia. Dr. Theye retired from the Mayo Clinic in 1977. He was married to Jo and they had four children. Dr. Theye died on Nov. 21, 1977.

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### **JOHN H. TINKER, M.D.**

Dr. John H. Tinker was born on May 18, 1941, in Cincinnati, Ohio. He attended the College of Engineering of the University of Cincinnati for 3 years and the Arts and Science College for 2 years. He received the B.S. degree, magna cum laude. He then went to the College of Medicine of the University of Cincinnati in Cincinnati, Ohio, and graduated in 1968, summa cum laude. He served a surgical internship at the Peter Bent Brigham Hospital of Harvard Medical School in Boston, Massachusetts. From 1969 to 1970, he was a resident in surgery at the Peter Bent Brigham Hospital, and from 1970 to 1972, he was a resident in anesthesiology at the same institution. He was certified by the American Board of Anesthesiology in 1973. In 1974, Dr. Tinker was appointed a consultant at the Mayo Clinic. In 1983, he resigned from the Mayo Clinic to become professor and chairman of the department of anesthesiology of the University Hospitals in



Iowa City. Currently, he is professor and chairman of the department of anesthesiology at the University of Nebraska in Omaha.

### **LUIS EDUARDO TORRES GARCIA, M.D.**

Dr. Luis Eduardo Torres Garcia was born on May 2, 1949, in Ensenada, Baja California, Mexico. He attended the California State University in Carson and graduated in 1972 with the B. A. degree. From 1972 to 1976, he studied medicine at the University of California in Irvine from which he received the M.D. degree in 1976. He served an internship in surgery at the University of California at Irvine Medical Center in Orange, California, from 1976 to 1977. In 1977, he began a residency in anesthesiology at the University of California in Los Angeles. He was then named an adjunct assistant professor of anesthesiology in the department of anesthesiology at the University of California in Los Angeles. In 1981, Dr. Torres joined the Mayo Clinic as a consultant. He resigned from the Mayo Clinic in 1982.



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### **NORMAN E. TORRES, M.D.**

Dr. Norman E. Torres was born on May 7, 1961. He entered the Mayo Graduate School of Medicine as a resident in anesthesiology in 1991. In 1995, he was appointed a senior associate consultant at the Mayo Clinic, Rochester. Currently, he is a consultant in anesthesiology.



### **LAURENCE C. TORSHER, M.D.**

Dr. Laurence C. Torsher was born on July 6, 1959, in Lethbridge, Alberta, Canada. He attended the University of Alberta in Edmonton, Alberta, and received a degree in electrical engineering in 1981. He studied medicine at the University of Calgary in Calgary, Alberta, and was awarded the M.D. degree in 1987. He completed a rotating internship at the Calgary General Hospital and then a residency in anesthesiology at the University of Ottawa in Ottawa, Ontario, Canada. He came to the Mayo Graduate School of Medicine in 1993, where he completed a fellowship in critical care, followed by a fellowship in transplant anesthesia. He joined the staff as a senior associate consultant in 1995. In 1999, Dr. Torsher resigned from the Mayo Clinic and joined the Anesthesia Associates in Duluth, Minnesota. Dr. Torsher was elected fellow of the Royal College of Physicians and Surgeons of Canada in Anaesthesia in 1992. In 1995, he was certified by the American Board of Anes-



thesthesiology (ABA), and also earned an ABA specialization certificate in critical care. Dr. Torsher is married to Lynn Durham. They have one child.

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### **RALPH MOORE TOVELL, M.D.**

Dr. Ralph Moore Tovell was born on Dec. 31, 1901, in Sydenham, Ontario, Canada. He received the M.D. degree from the Queen's University in Kingston (Canada) in 1926. In 1929, Dr. Tovell entered the Mayo Graduate School of Medicine as a fellow in anesthesiology. In 1929, he was appointed a consultant in anesthesiology. In 1935, he was promoted to assistant professor of anesthesiology in the Mayo Graduate School of Medicine. In 1939, Dr. Tovell resigned from the staff of the Mayo Clinic to become chief of anesthesiology at Hartford Hospital, Hartford, Connecticut, a position he held until 1963. Dr. Tovell was widely recognized for his work in local anesthesia. He was one of the founders of the American Board of Anesthesiology (ABA) and was certified in 1938 by the ABA. He was an associate editor of *Anesthesiology*. He served as president of the American Society of Anesthesiologists and of the Academy of Anesthesiology in 1953. Dr. Tovell served in the U. S. Army during World War II (1939-1945). He



was made an honorary fellow of the Association of Anaesthetists of the Royal Society of Medicine of England and a foreign fellow of the Royal College of Surgeons of England. Dr. Tovell died on Jan. 7, 1967. He and his wife Lavina had two children.

### **TERRENCE L. TRENTMAN, M.D.**

Dr. Terrence L. Trentman was born in San Diego, California, on July 20, 1962. He attended Sierra Community College (California) and Brigham Young University (Utah), earning both an associate and a bachelor degree of science, magna cum laude. During this time, he took 18 months off to serve as a religious missionary in Melbourne, Australia. To help meet the expenses of a private medical education, Dr. Trentman joined the U. S. Air Force's health professions scholarship program. It was during the summer of 1988 that he was first introduced to anesthesia, at Travis Air Force Base in Fairfield, California. He moved to Rochester (Minnesota) in 1990. After 1 year of training in internal medicine, he began a residency in anesthesia in 1991. He completed the program in 1994, and then remained an extra year as a fellow in pain management. He joined the U. S. Air Force, where he was a staff anesthesiologist and director of the pain clinic at Kessler U. S. Air Force Medical Center. In 1998, he joined the staff of the Mayo



Clinic Scottsdale. Dr. Trentman divides his time between the pain clinic and the operating room and is a member of the liver transplant team. He and his wife Laralee have four children.

### **EDWARD B. TUOHY, M.D.**

Dr. Edward B. Tuohy was born on Mar. 17, 1908, in Duluth, Minnesota. He received the M.D. degree in 1932 from the University of Pennsylvania (Philadelphia). After an internship, he became a fellow in medicine at the Mayo Clinic in 1933. In 1935, he changed his interest to anesthesiology, and later that year, he was appointed to the staff as a consultant in anesthesiology. In 1936, he was the first physician in the United States to receive the M. S. degree in anesthesiology. In 1939, he was certified by the American Board of Anesthesiology (ABA). During World War II (1939-1945) he served in the U. S. Army Medical Corps. After the war, he resumed his position at the Mayo Clinic and was promoted to associate professor of anesthesiology in the Mayo Graduate School of Medicine. Dr. Tuohy resigned from the Mayo Clinic in 1947 to become professor of anesthesiology in the Georgetown University School of Medicine (Washington, D.C.). In 1951, he moved to Los Angeles, where he became a professor of surgery (anesthesiology) at



the University of Southern California School of Medicine. Dr. Tuohy was President of the American Society of Anesthesiologists in 1947 and a member of the ABA from 1950 to 1955. He and his wife Dorothy were parents of three children. Dr. Tuohy died on Jan. 12, 1959.

### **GERALD F. TUOHY, M.D.**

Dr. Gerald F. Tuohy was born on Mar. 31, 1934, at St. Marys Hospital, Rochester, Minnesota. He attended the University of Minnesota (Minneapolis) and received the M.D. degree in 1959. Dr. Tuohy entered the Mayo Clinic as a fellow in 1960, and was appointed an assistant to the staff in 1962 and a consultant in 1963. In 1971, he founded the department of anesthesia at St. Luke's Hospital in Kansas City, Missouri, which became the department of anesthesiology of the University of Missouri-Kansas City, and he was a professor and chairman until his retirement in 1997. Dr. Tuohy served in the house of delegates of the American Society of Anesthesiologists, was a member and chairman of the subcommittee on Emergency Medical Technician-Paramedic Training for several years, and was president of the Missouri Society of Anesthesiologists. Presently, Dr. Tuohy is professor emeritus, University of Missouri-Kansas City,



and lives with his wife Darlene in Leawood, Kansas.

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### **RUSSELL A. VAN DYKE, Ph.D.**

Dr. Russell A. Van Dyke was born on Feb. 8, 1930, in Rochester, New York. He received the Ph.D. degree in biochemistry from the University of Illinois (Champaign-Urbana) in 1960. In 1968, after several years of postdoctoral research, Dr. Van Dyke came to Rochester, Minnesota, as an associate professor in anesthesiology and pharmacology in the Mayo Graduate School of Medicine and a consultant in the department of anesthesiology. Subsequently, Dr. Van Dyke was promoted to professor of pharmacology and biochemistry in the Mayo Medical School. Dr. Van Dyke was widely recognized for his contributions to the understanding of the metabolism and pharmacodynamics and toxicity of the volatile anesthetics. He was the first scientist to report the metabolism of the volatile anesthetic in laboratory animals. In 1989, he retired from the Mayo Clinic. He became the director of research in the anesthesiology department of Henry Ford



Hospital in Detroit, Michigan. He retired from that position in 1994. Dr. Van Dyke is married to Sally Olsen. They have two children.

### **GURINDER M. S. VASDEV, M.D.**

Dr. Gurinder M. S. Vasdev was born on July 21, 1962, in Nairobi, Kenya. He completed his medical school training at the Middlesex Hospital Medical School, University of London, England, in 1985. After an internship in general medicine and surgery, he completed the training in anesthesia at Addenbrooke's Hospital, University of Cambridge, England. He passed the fellowship examinations of the Royal College of Anaesthetists, England, and the Faculty of Anaesthesia, Royal College of Surgeons, Ireland, in 1991. Dr. Vasdev served a fellowship in obstetric anesthesia and critical care medicine at the Mayo Clinic from 1991 to 1992. In 1993, he was appointed a special clinical fellow in anesthesiology. In 1994, Dr. Vasdev became an assistant professor of anesthesiology at the University of Connecticut, Farmington. In 1995, Dr. Vasdev joined the staff of the department of anesthesiology at the Mayo Clinic Rochester, where he now serves as the director of obstetrical anesthesia.



He is certified by the American Board of Anesthesiology in anesthesiology and critical care medicine. He and his wife Billie have three children.

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### **FRANK JOSEPH VILLAMARIA, M.D.**

Dr. Frank Joseph Villamaria was born in Frontenac, Kansas, on Apr. 29, 1955. He attended the Pittsburg State University, Pittsburg, Kansas, and received the B.S. degree in 1973. He then studied medicine at the University of Kansas Medical School (Kansas City) and earned the M.D. degree in 1980. He served as a U. S. naval flight surgeon from 1981 to 1984, achieving the rank of commander. Dr. Villamaria came to the Mayo Clinic as a resident in anesthesiology in 1984. He completed a residency and subsequent fellowship in cardiovascular anesthesiology. He was appointed a senior associate consultant and an instructor of anesthesiology in the Mayo School of Medicine in 1987. Dr. Villamaria was certified by the American Board of Anesthesiology in 1987. In 1989, he resigned from the Mayo Clinic to join Scott & White in Temple, Texas, where he has served as vice chairman and chairman of the department of anesthesiology. Currently, he serves as associate medical director for quality, member of the board of governors, senior staff anesthesiologist at Scott & White



Clinic, Hospital and Health Plan in Temple, Texas. He is an assistant professor of anesthesiology, Texas A&M University Health Science Center College of Medicine. He and his wife Maureen have five children.

### **LISA J. VUKALCIC, M.D.**

Dr. Lisa J. Vukalcic was born on Dec. 15, 1955, in Mount Clemens, Michigan. She attended St. Mary's College in Los Angeles, California, from 1973 to 1977 and received the B.S. degree in biological science, magna cum laude. She then studied medicine at the University of California in San Francisco, California. In 1982, she entered the Mayo Graduate School of Medicine as a resident in internal medicine. From 1984 to 1986, she completed a residency in anesthesiology at the Rush Presbyterian St. Luke's Medical Center in Chicago, Illinois. In 1987, she joined the Mayo Clinic as a senior associate consultant. Dr. Vukalcic resigned from the Mayo Clinic in 1993.



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### **JULIAN R. WAGGONER, III, M.D.**

Dr. Julian R. Waggoner, III, joined the Mayo Graduate School of Medicine in 1994 as a resident in anesthesiology. In 1997, he was appointed a senior associate consultant and currently works at the Austin Clinic in Austin, Minnesota.



### **JOSEF K. WANG, M.D.**

Dr. Josef K. Wang was born on Mar. 23, 1937. He attended National Taiwan University Medical School (China) and received the M.D. degree in 1961. He served a residency in surgery at the University of Hamburg, Germany, from 1963 to 1965. He entered the Mayo Graduate School of Medicine as a resident in anesthesiology in 1965 and completed training in anesthesiology in 1968. He returned to Mayo Clinic as a consultant in anesthesiology in 1974 specializing in pain management. In 1968, he was recognized by Science Citation Index for his pioneering work on intrathecal morphine injection. He resigned from the Mayo Clinic in 1986 and became professor of anesthesiology and medical director at Yale University (Connecticut). Since 1988, he has been president of the Pain Management Center of New England.



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### **R. DORIS WANG, M.D.**

Dr. R. Doris Wang was born in Taipei, Taiwan, on Sept. 24, 1967. She graduated from the University of Florida in 1990 and its College of Medicine in 1994. After completing an anesthesiology residency at the University of Florida, she undertook a year of fellowship training in regional anesthesia at the University of Florida and Brigham and Women's Hospital in Boston, Massachusetts. Dr. Wang's fellowship research focused on the application of continuous peripheral nerve block for outpatient orthopedic surgery, an area of continued interest. This work was funded by the I. Heerman Anesthesia Foundation. Dr. Wang became a senior associate anesthesia consultant at the Mayo Clinic Jacksonville in 1999, the same year in which she became certified by the American Board of Anesthesiology. Dr. Wang is married to Dr. Edwin Meyer, associate professor in the department of



pharmacology and therapeutics at the University of Florida.

### **DAVID O. WARNER, M.D.**

Dr. David O. Warner was born in Columbus, Ohio, on May 31, 1957, the progeny of two pediatric anesthesiologists. He obtained an undergraduate degree in electrical engineering and the M.D. degree from the Ohio State University (Columbus), summa cum laude, in 1983. He was lured to Rochester by his cousin, Dr. Mark Warner, and completed a 5-year residency at the Mayo Clinic, which included 2 years as a research fellow under the mentorship of Dr. Kai Rehder. Since he joined the staff in 1988, Dr. Warner's clinical interests have centered on pediatric anesthesia. His research interests include respiratory physiology in the perioperative period, ranging from human clinical investigation to investigation of basic contractile regulation of airway smooth muscle. He cofounded the Mayo Perioperative Outcomes Group in 1995 to encourage clinical investigation in anesthesia. He was named a Clinician Investigator of the Mayo



Foundation in 1998. Dr. Warner is married to Julie Warner and has three children, Carolyn, Jonathan, and Nathaniel.

### **MARK A. WARNER, M.D.**

Dr. Mark A. Warner was born on Oct. 7, 1953, in Greenville, Ohio. After graduating from Miami University in Oxford, Ohio, in 1976 and from the Medical College of Ohio in Toledo, Ohio, in 1979, he entered the Mayo Graduate School of Medicine as a fellow in anesthesiology. In 1983, he was appointed a consultant and an instructor of anesthesiology in the Mayo School of Medicine. He rose through the academic ranks and was promoted to professor of anesthesiology in 1995. In 1995, Dr. Warner became the Mayo Clinic Rochester's Clinical Practice Committee Vice-Chair for Hospital Operations, directing the Mayo hospitals for 5 years. In 1999, he succeeded Dr. Duane Rorie as chair of the department of anesthesiology. Dr. Warner is widely recognized for his studies on perioperative outcomes. He was certified as a Diplomate of the American Board of Anesthesiology in 1985 and currently is a director of that organization. He served the Minnesota Society of Anesthesiologists in many capacities and was its president from 1995 to 1996. Dr. Warner currently is a director of the Anesthesia Patient Safety Foundation. He chaired the American Society of Anesthesi-



ologists Annual Meeting in 2000 and three of its practice parameter committees. He was appointed a McMillan Scholar by the Mayo Foundation in 1999 and was honored as the first distinguished alumnus of the Medical College of Ohio in 2000. He and his wife Mary Ellen, also an anesthesiologist at the Mayo Clinic, have four sons.

### **MARY ELLEN WARNER, M.D.**

Dr. Mary Ellen Warner was born on May 29, 1954, in Chillicothe, Ohio. After graduating from the University of Florida (Gainesville) in 1975 and receiving the M.D. degree from the Medical College of Ohio at Toledo, Ohio, in 1979, she entered the Mayo Graduate School of Medicine as a fellow in anesthesiology. In 1983, she was appointed a consultant and an instructor of anesthesiology in the Mayo School of Medicine. Presently, she holds the rank of an assistant professor and is chair of the south division in the department of anesthesiology. She is active in the department as chair of its quality improvement committee and in the institution as chair of the conscious sedation task force. Dr. Warner is interested in studies on perioperative outcomes and quality improvement. She was certified as a Diplomate of the American Board of Anesthesiology in 1985. She has served the Minnesota Society of Anesthesiologists as secretary-treasurer and is currently serving the American Society of Anesthesiologists as a mem-



ber of the house of delegates. She was recently nominated as a member of the trustees of the Wood Library-Museum of Anesthesiology in Chicago, Illinois. Dr. Warner and her husband Mark, also an anesthesiologist at the Mayo Clinic, have four sons.

### **C. THOMAS WASS, M.D.**

Dr. C. Thomas Wass was born on Apr. 11, 1961, in Glendale, California. He received the B. A. degree in chemistry from West Virginia University in Morgantown in 1984 and the M.D. degree in 1989 from the West Virginia University School of Medicine in Morgantown. Dr. Wass completed an internship and a residency in anesthesiology at the West Virginia University Hospital. He then completed a fellowship in neuroanesthesia at the Mayo Clinic from 1993 to October 1995. In 1994, he was certified by the American Board of Anesthesiology. In 1995, Dr. Wass was appointed a senior associate consultant at the Mayo Clinic and was promoted to consultant in 1998. Currently, he is an assistant professor of anesthesiology in the Mayo Medical School. His research interests include cerebral ischemia, cerebral protection and resuscitation, regional temperature gradients during cardiopulmonary bypass, education in anesthesia, and ecology of red blood cell transfusion. He was the recipient of the Society of Neurosurgical Anesthesia and



Critical Care's new investigator award in 1994 and the Richard A. Theye Award for research in 1995. He was recipient of the Distinguished Clinician Award in 1995 and of the Teacher of the Year Award from 1996 to 1999. Dr. Wass and his wife Sharon have four children.

### JOSEPH G. WEBER, M.D.

Dr. Joseph G. Weber was born on Oct. 27, 1962. Growing up in the small town of Danvers in rural Minnesota, he was a national merit scholar at high school. He graduated summa cum laude with a degree in biology from Moorhead State University in 1986 and then entered the Mayo Medical School. While a medical student, he became involved in anesthesiology clinical research, and upon obtaining his M.D. degree in 1990, he began a residency in anesthesiology at the Mayo Clinic. During this residency, he spent a year working in Scottsdale, and upon its completion, was appointed as consultant at the Mayo Clinic in Scottsdale in 1994. In the subsequent 3 years, he undertook research exploring the association between caffeine withdrawal and postoperative headaches. Publication of this paper had important therapeutic implications on the management of these headaches. He left the Mayo Clinic in 1997 to accept a position at the Hennepin Faculty Associates in Minneapolis, Minnesota. Dr. Weber met his future wife, Dr.



Debra M. Kim, while they were both in medical school at the Mayo Clinic. Currently, they reside in St. Paul. They are both enrolled in the University of St. Thomas Graduate School of Business while continuing to have a busy medical practice.

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### DENISE J. WEDEL, M.D.

Dr. Denise Wedel was born on Aug. 14, 1952, in Duluth, Minnesota. She received the B.S. degree, magna cum laude, and the M.D. degree from the University of Minnesota, Minneapolis. She completed a residency in anesthesiology at the Mayo Clinic from 1978 to 1981, and a fellowship in regional anesthesia at Virginia Mason Clinic (Seattle, Washington) from 1981 to 1982. She joined the Mayo Clinic as an instructor of anesthesiology in the Mayo Medical School in 1989. In 1996, Dr. Wedel was promoted to professor of anesthesiology. She was on the board of directors of the American Society of Regional Anesthesia (ASRA) from 1991 to 1999, serving as president in 1998. In 1995, she was appointed editor of the regional anesthesia and pain management section in *Anesthesia and Analgesia*. Dr. Wedel has published extensively in the areas of malignant hyperthermia and regional anesthesia. She is a nationally and internationally recognized lectur-



er. Dr. Wedel is married to Peter Wilson, also an anesthesiologist at the Mayo Clinic in Rochester.

### **MARGARET R. WEGLINSKI, M.D.**

Dr. Margaret R. Weglinski was born in Minneapolis, Minnesota, on June 14, 1959. She received the M.D. degree from the University of Minnesota in Minneapolis in 1985. She completed a residency training in anesthesiology at the Mayo Clinic in 1989 and then joined the department as a senior associate consultant. She was appointed a consultant in 1992. Her chief areas of interest are neuroanesthesia and malignant hyperthermia. She was appointed chair of the division of neuroanesthesia in 1993. In 1991, she began counseling patients with malignant hyperthermia and biopsying their tissues. She has served as a hotline consultant for the Malignant Hyperthermia Association of the United States since 1997.



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### **KENT P. WEINMEISTER, M.D.**

Dr. Kent P. Weinmeister was born on Mar. 5, 1950, in Aledo, Illinois. He received the M.D. degree from the University of Illinois College of Medicine, Chicago. After a residency in family practice at the University of Iowa (Iowa City), he entered the Mayo Graduate School of Medicine and finished his fellowship in anesthesiology in 1981. He then practiced anesthesia in Springfield, Illinois, and was a clinical assistant professor of anesthesiology at Southern Illinois University School of Medicine (Carbondale). In 1987, he joined the Mayo Clinic Scottsdale, where he started the pain clinic. He was appointed an instructor of anesthesiology in the Mayo School of Medicine in 1998. He was head of section for 10 years.



### **JEFFREY O. WELNA, D.O.**

Dr. Jeffrey O. Welna was born on Aug. 22, 1957, in Little Falls, Minnesota. He graduated from Kirksville College of Osteopathic Medicine (Missouri) in 1982 and completed his training in anesthesiology in 1988. He joined the Mayo Clinic as an associate consultant in 1988, advanced to a senior associate consultant in 1989, and was appointed a consultant in 1992. He is an assistant professor of anesthesiology in the Mayo Medical School. He is a member of the multi-specialty division at St. Marys Hospital. His career has been enriched by caring for His Majesty King Hussein of Jordan from 1992 to 1999. He and his wife Marie have two children.



### **ROGER D. WHITE, M.D.**

Dr. Roger D. White was born in 1939 in Ontonagon, Michigan. After 1 year at Suomi College in Hancock, Michigan, he transferred to the University of Michigan, Ann Arbor, where he completed premedical and medical school studies, graduating from the University of Michigan Medical School in 1964. His internship was at Henry Ford Hospital (Detroit, Michigan) in 1965, after which he began a residency in internal medicine at the Mayo Graduate School of Medicine. His training was interrupted in 1966 by a 2 year tour of duty in the U. S. Army. His military obligation included on-the-job training in anesthesiology. In 1968, he began a residency in anesthesiology at the Mayo Clinic, which included 6 months in cardiac anesthesia. In 1970, he joined the consulting staff of Mayo Clinic. His career in anesthesiology at the Mayo Clinic has been spent in cardiac anesthesia. With a life-long interest in ambulances and emergency medical services (EMS), he developed an advanced life support EMS service in Rochester. With the assistance of Dr. Paul Didier, he took steps to move the ambulance service to an advanced life support service. In 1978, these emergency medical technicians were among the first in the United States to be examined and certified as paramedics by the National Registry of Emergency Medical Technicians. Dr. White also assumed roles in many national agencies, including the American Heart Association's (AHA) Committee on



Emergency Cardiac Care, which developed the Advanced Cardiac Life Support training program. Presently, he serves on the AHA basic life support subcommittee and on the board of directors of the National Registry of Emergency Medical Technicians. In 1990, Dr. White launched an early defibrillation program in the city of Rochester. This program has reported the highest survival rate in the United States from out-of-hospital cardiac arrest caused by ventricular fibrillation. Dr. White maintains his full-time commitment to the practice of cardiac anesthesia at the Mayo Clinic Rochester. He is married to Marilyn Crawford, a nurse anesthetist, and has two children.

### **MARY LEITSCHUH WHITLEY, M.D.**

Dr. Mary Leitschuh Whitley was born on Aug. 26, 1953, in Portland, Oregon. She attended the University of Oregon in Eugene and received the B.S. degree in 1976. Thereafter, she did graduate studies in biology at the College of William and Mary in Williamsburg, Virginia, and computer studies at the University of North Carolina, Charlotte. In 1983, she began the study of medicine at the East Carolina School of Medicine in Greenville, North Carolina, and earned the M.D. degree in 1987. She completed an internship in internal medicine at the Georgetown University Hospital in Washington, D. C. In 1988, she began her training in anesthesiology, first at the Georgetown University Hospital (Washington, D.C.) from 1988 to 1989, and then at the Brigham and Women's Hospital (Boston, Massachusetts) from 1989 to 1991. She joined the faculty at Georgetown University Hospital for 3 years in 1991 then moved with her husband, W. David Whitley, M.D., to Rochester, Minnesota, where she completed a fellowship in anesthesia for vascular surgery. She served as an associate consultant at the Mayo Clinic from 1994 to 1996. After



2 years in private practice in Providence, Rhode Island, she joined Anesthesia Services of Birmingham in Birmingham, Alabama, where her husband is an associate professor of vascular surgery at the University of Alabama in Birmingham. She and her husband have two sons.

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### **LORRY A. WIDGER, M.D.**

Dr. Lorry Widger was born on May 30, 1946, in Syracuse, New York. He attended Northwestern University, Evanston, Illinois, from 1964 to 1966. He studied medicine at Northwestern University, Chicago, Illinois, (1966 to 1971), and at the University of Oslo, Norway (1968 to 1969). In 1969, he received the M.D. degree. He served his internship at the LaCrosse Lutheran Hospital/Gundersen Clinic in LaCrosse, Wisconsin, from 1971 to 1972. He then entered the Mayo Graduate School of Medicine as a resident in anesthesiology in 1973. In 1976, Dr. Widger was appointed a consultant at the Mayo Clinic, Rochester. Dr. Widger resigned from the Mayo Clinic in 1976 to move to Fresno, California.



### **DEBORAH ANN W. WILKOWSKI, M.D.**

Dr. Deborah Ann W. Wilkowski was born on Sept. 26, 1954, in Greenbush, Minnesota. She received the B.S. degree from the University of Minnesota, Minneapolis, in 1976. She then attended the Medical School of the University of Minnesota and received the M.D. degree in 1982. She served a residency in anesthesiology at the University of Michigan, Ann Arbor, from 1982 to 1985, which was followed by a fellowship in cardiovascular and thoracic anesthesia at the Mayo Graduate School of Medicine. From 1986 to 1987, she was on the staff of the Mayo Clinic, Rochester. She was certified by the American Board of Anesthesiology in 1987. She resigned from the Mayo Clinic, and in 1987, she joined the University of Texas Health Science Center in San Antonio as an assistant professor of anesthesiology. In 1990, she entered private practice at the Martha Jefferson Hospital in Charlottesville,



Virginia. She and her husband Michael James, a nephrologist, have three children.

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### **JACK L. WILSON, M.D.**

Dr. Jack L. Wilson was born in Minot, North Dakota, on Oct. 16, 1960. He attended the University of North Dakota School of Medicine (Grand Forks), graduating in 1989. He completed a 1-year internship at Gunderson Medical Foundation/Lutheran Hospital in LaCrosse, Wisconsin, from 1989 to 1990, followed by a residency in anesthesiology at the University of Tennessee Medical Center in Knoxville, Tennessee. Dr. Wilson joined the staff of Meritcare/Bemidji Clinic in Northern Minnesota in 1993. In 1996, he began a fellowship in pain medicine at the Mayo Clinic Rochester. After completion of the fellowship, he was appointed a senior associate consultant in 1997, with assignment to the pain division. He is a Diplomate of the American Board of Anesthesiology (ABA) and has an added ABA certification in pain management. He has served as the director of the pain management fellowship since the fall of 1997 and is an instructor in anesthesiology in the Mayo



Medical School. Dr. Wilson and his wife Suzanne have two children and reside in Rochester, Minnesota.

### **PETER R. WILSON, M.D., Ph.D.**

Dr. Peter R. Wilson was born on July 15, 1941, in Lucindale, Australia, graduating with the M.D. and Ph. D. degrees from the University of Adelaide (Australia), and becoming board certified in anesthesiology (FFARACS). In 1976, with a Fulbright scholarship, he began a postdoctoral fellowship with Drs. Frederic Kerr and Tony Yaksh at the Mayo Clinic and worked in the pain clinic, with an emphasis on the spinal action of opioids and other neurochemicals, including baclofen. He returned to Australia in 1978, to become the medical director of the pain clinic at Flinders University. He returned to the Mayo Clinic in 1982. Since then, he has been active in pain management, president of the American Academy of Pain Medicine and American Board of Pain Medicine, chair of the American Society of Anesthesiologists committee on Pain Management, editor-in-chief of the *Clinical Journal of Pain*, member of the board of trustees of the Commission on Accreditation of Rehabilitation Facilities, alternate delegate to the American Medical Association, and a member of various



other committees and editorial boards of national and international pain organizations. Since 1983, he has been an associate professor of anesthesiology in the Mayo School of Medicine. He is married to Denise Wedel, also an anesthesiologist at the Mayo Clinic.

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### **TODD M. WITZELING, M.D.**

Dr. Todd Witzeling was born in Worland, Wyoming, on Apr. 20, 1957. He received the B.S. degree in pharmacy from the University of Wyoming (Laramie) in 1980. He received the M.D. degree, cum laude, from Creighton University in Omaha, Nebraska, in 1984. Dr. Witzeling entered the Mayo Graduate School of Medicine as a fellow in cardiovascular anesthesiology in 1987. In 1988, he was appointed a senior associate consultant and an instructor of anesthesiology in the Mayo School of Medicine. In 1990, he resigned from the staff and moved to Casper, Wyoming, to enter private practice with Dr. Robert Patrick's group. Dr. Witzeling was certified by the American Board of Anesthesiology in 1989. He has served as an alternate district director to the American Society of Anesthesiologists from District 20 and president of the Wyoming Society of Anesthesiologists. Dr.



Witzeling is married to Nancy. They have a son Scott and a daughter Jennifer.

### **GILBERT Y. WONG, M.D.**

Dr. Gilbert Y. Wong was born on May 17, 1963, in Montreal, Canada. He graduated from the University of California, Davis, receiving the B.S. degree in biochemistry and the B.A. degree in psychology. In 1990, he received the M.D. degree from the Loyola University Stritch School of Medicine, Chicago, Illinois. In 1990, he became a fellow in anesthesiology at the Mayo Graduate School of Medicine. He then had a fellowship in pain management from 1994 to 1995 and in research from 1995 to 1996. As a resident, he received several awards, including the American Society of Anesthesiologists resident research essay contest first prize, the Richard A. Theye memorial award for outstanding achievement, and first place in basic sciences from the Midwest Anesthesia Resident's Conference. In 1995, Dr. Wong joined the staff at the Mayo Clinic and became an assistant professor of anesthesiology in the Mayo School of Medicine in 1997. Dr.



Wong's major interest is the clinical practice and research in cancer pain management. He and his wife Dana have two children.

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### **GLENN E. WOODWORTH, M.D.**

Dr. Glenn E. Woodworth was born on Sept. 15, 1960, in Vandenberg, California. He attended the University of California in San Diego and received the B.A. degree in 1982. In 1982, he matriculated at the University of California School of Medicine in San Diego and earned the M.D. degree in 1986. He served an internship and a residency in anesthesiology at Mercy Hospital and Medical Center in San Diego. In 1989, he entered the Mayo Graduate School of Medicine as a resident in anesthesiology. In 1990, he was appointed a senior associate consultant. He resigned from the Mayo Clinic in December 1990.



### **FERNANDO A. ZEPEDA, M.D.**

Dr. Fernando A. Zepeda was born on Dec. 13, 1967, in San Salvador, El Salvador. He graduated from Christian Brother University in Memphis, Tennessee, in 1989 and received the M.D. degree from J. H. Quillen College of Medicine, East Tennessee State University in Johnson City, Tennessee, in 1993. After an internship at Methodist Hospital of Memphis, from 1993 to 1994, he became a fellow in anesthesiology at the Mayo Graduate School of Medicine. He was then a staff anesthesiologist at Buchanan General Hospital in Grundy (Virginia) before joining the staff of the Mayo Clinic in 1999.



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### **AVISHAI ZISER, M.D.**

Dr. Avishai Ziser was born in Israel on Aug. 26, 1953. He received the medical degree from The Hebrew University, Hadassah Medical School in Jerusalem in 1981. He entered the Mayo Graduate School of Medicine as a fellow in critical care medicine in 1991; then spent 1 year as a fellow in cardiothoracic and vascular anesthesia. Dr. Ziser was appointed an associate consultant and an instructor of anesthesiology in the Mayo School of Medicine. In 1994, he was promoted to assistant professor. Since 1994, Dr. Ziser has practiced as a staff anesthesiologist, critical care physician, and head of the cardiothoracic anesthesia unit in Rambam Medical Center, Haifa, Israel.



## Anesthesiology Research Fellows and Visiting Scientists



Abboud, Nabil



Abraham, Theodore



Adams, R. Charles



Akao, Masaki



Albin, Maurice S.



Albrocht, Ronald F., II



Altenburg, Bernard M.



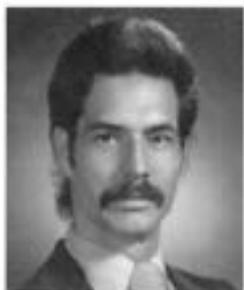
Anmari, Ramzi



Anderson, Bruce M.



Anderson, Charles D.



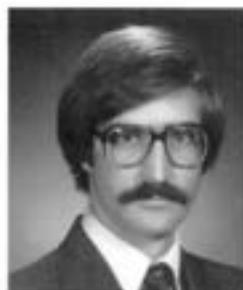
Artru, Alan A.



Austrup, Mona L.



Baele, Philippe L.



Baker, Max T.



Barnes, Roxann D.



Barrett, Richard H.



Bartunek, Anna E.



Beck, Kenneth C.



Beers, Thomas



Bekele, Afessa



Best, Patricia J.



Betlach, Charles J.



Beynen, Proukje M.K.



Boehlecke, Brian



Boston, Umar



Brown, William T.



Bryce, Rex



Boukatina, Anna E.



Bremerich, Dorothee H.



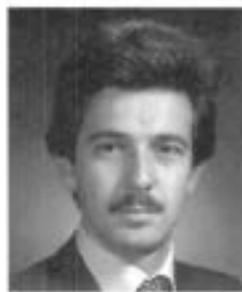
Brice, Glenn A.



Brichant, Jean-Francois



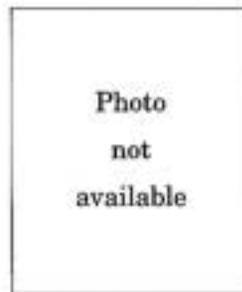
Brooks, Lowell M.



Brassasco, Vito



Buck, Conrad C.



Cable, David G.



Cameron, Peter D.



Carton, Edmund G.



Chen, Feng-Yuan



Christopherson, Thomas J.



Cook, David J.



Coentino, Francesco



Courtin, Raymond F.



Crawford, Matthew R.



Crennell, Ean H.



Cucchiara, Roy F.



d'Uscio, Livius Vinzenz



Dapkus, David



deCastro, Luisaita Reyes



Decramer, Marc L.A.



Delmonico, E. Joseph



Dickerman, David



Dietz, Niki M.



Dunlop, John G.



Durant, Philippe A.



Eghbali, Fatourechi G.



Eguchi, Daihiko



Engelke, Keith A.



Fajarde, Elena Urgelles



Faulconer, Albert, Jr.



Fazio, Anthony N.



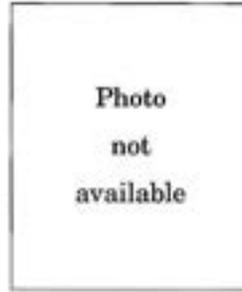
Felleiter, Peter



Fenton, Alexis O.



Fibuch, Eugene E.



Fieldman, E. Jay



Fleischer, Jerry E.



Fletcher, Grant



Forsman, Marianne



Foster, Steven



Frazier, Arnold



Fukushima, Tomihiro



Gandolfi, A. Jay



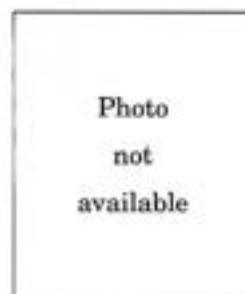
Gaumann, Dorothee



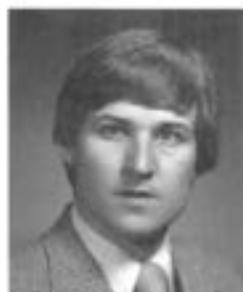
Gelb, Adrian W.



Gharib, Ali



Gisvold, Sven E.



Glenski, James A.



Gosselin, Luc E.



Gould, Allan B.



Green, Daniel J.



Halliwill, John R.



Hanazaki, Motohiko



Hannon, James Donald



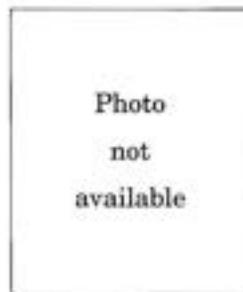
Hardman, William N.



Hatch, David J.



Hattox, John S.



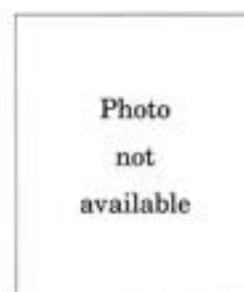
Hayashi, Yoshimura



Hebl, James R.



Heffron, James



Hempelmann, Ralf



Heunks, Leo M.



Hirasaki, Akihito



Hofer, Roger E.



Hosking, Michael P.



Housmans, Philippe R.



Hrometz, Sandra L.

Photo  
not  
available

Hughes, David R.

Photo  
not  
available

Hughson, Richard



Hunter, Robert C.



Iaizzo, Paul A.



Iida, Yasuhiko

Photo  
not  
available

Isbir, Olcay



Jankowski, Christopher J.



Javier, Aduen



Johnson, Bruce D.



Jones, Cecil S.



Jones, Keith A.



Joyner, Michael J.



Juno, Phillip

Photo  
not  
available

Kafer, Enid R.



Kahraman, Z. Sibel



Kai, Tetsuya



Kamath, Gerard S.



Kanazi, Ghassan



Kannan, Mathur S.

Photo  
not  
available

Karlsson, Bente R.



Katussic, Zvonimir



Keates, Albert E.



Keegan, Mark T.



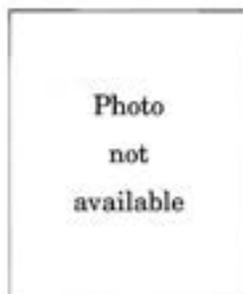
Khurana, Gautam Z.



Kiersey, Donald K.



Kinoshita, Hiroyuki



Klineberg, Peter L.



Knutson, Robert C.



Kobylka, David



Kongsayroeping, Suneerat



Korten, Klaus W.



Krayzer, Sebastian



Kumar, Muthuswami (Matthew)



Kwak, Young-Lan



Landmark, Sandra J.



Lanier, William L.



Latterell, Kenneth E.



Lau, Hon-Ping



Legler, Dwight C.



Li, Li



Liam, Beng Ling



Lindahl, Sten G. E.



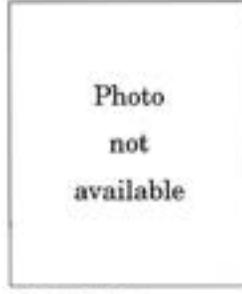
Liopyris, Panayota



Lunn, Jeffrey J.



Machiels, Herwin



MacVeigh, Ian



Mallow, James E.



Mantilla, Carlos B.



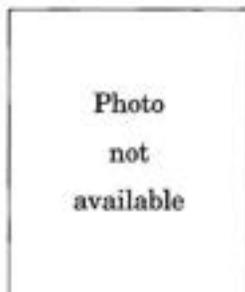
Marsh, H. Michael



Martin, Rene



Masters, David B.



Mattheussen, Maria



McGlinch, Brian



Megirian, David B.



Mertens, Luc L.



Messick, Joseph M., Jr.



Milde, Leslie N.



Minson, Christopher T.



Mitrovic, Bora Srbisavić



Miyata, Hirofumi



Moffitt, Emerson A.



Morimoto, Naoki



Morrison, Andrew E.



Moukabary, Kamal



Mousel, Lloyd H.



Moustafa, Gamal



Muldoon, Sheila M.



Murat, Isabelle



Nahel, Saïed



Nelson, David O.



Nugent, Michael



Nuttall, Gregory



O'Neill, Nial C.



Onoue, Hisashi



Osborn, John E.



Ozhan, Mustafa



Pabelick, Christina M.



Padakandia, Udaya



Park, Jong-Kwan



Patrick, Robert T.



Paulson, John A.



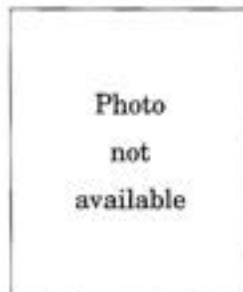
Pender, John W.



Perkins, William J.



Peterson, John R.



Pettis, Michael S.



Ploch, Walter



Polis, Tomasz Z.



Possati, Serafino



Prakash, Y. S.



Proctor, David N.



Rajala, Mary M.



Reed, Karen S.



Regnier, Michael



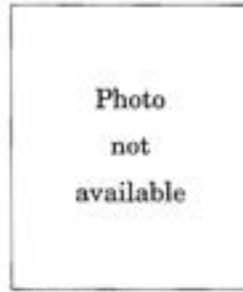
Rehder, Kai



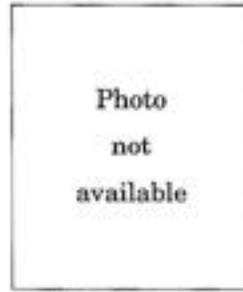
Rich, Charles R.



Ridley, Roger W.



Ronald, Ole K.



Rocchi, Danilo



Rorie, Duane K.



Sayiner, Abdullah



Scheidt, Monika E.



Schmid, Edith R.



Schnelle, Norbert



Searles, Paul W.



Seekin, Inanc A.



Seldon, Thomas H.



Sill, J. Christopher



Sittipong, Rungson



Smith, Frederic A.



Smithson, Kenneth G.



Soltero, Donald E.



Song, He-Sun



Southorn, Peter A.



Stangland, Kenneth J.



Stapelfeldt, Wolf H.



Steen, Petter A.



Storni, Mario P. C.



Streiff, John



Stuart-Smith, Karen



Stulken, Edward H.



Sujirattanawimol, Kittiphong



Sungurtekin, Hulya



Takeshita, Hiroshi



Tantivitayatan, Kamthorn



Taylor, Harry E.

Photo  
not  
available

Thompson, Matthew D.



Tirmaksiz, Nehmet B.



Togailbayeva, Anel A.



Torp, Klaus



Tovell, Ralph M.

Photo  
not  
available

Tsao, Thomas Change-Yao



Tschakovsky, Michael E.



Tsutsui, Masato



Tuohy, Edward B.

Photo  
not  
available

Van Balkom, Roland



Vandenoorn, Rene

Photo  
not  
available

Van der Heijden, Eric



Vandersteent, David R.

Photo  
not  
available

Vantrappen, Ann



Vettermann, Jörg



Wagner, Stephen R.



Wang, Josef K.



Warner, David O.



Wass, C. Thomas



Weglinski, Margaret R.



Werner, Eric



Wieling, Wouter



Wenthe, Fritz M.



Widger, Lorry A.



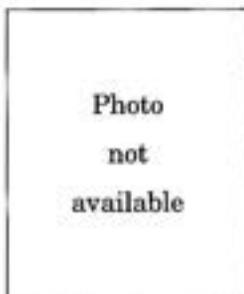
Wilson, Louise E.



Wilson, Peter R.



Wong, Gilbert Y.



Wood, Catherine



Yamamoto, Koro



Yoshimura, Hayashi



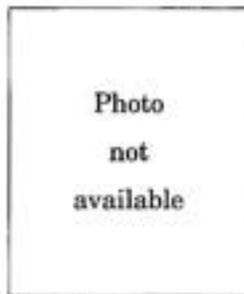
Zacharias, David A.



Zagaria, James F.



Zhan, Wen-Zhi



Zhang, Tao



Ziser, Avishai

## Anesthesiology Clinical Fellows

### Cardiovascular/ Thoracic Anesthesia



Augustine, Scott D.



Banoub, Ashraf F.



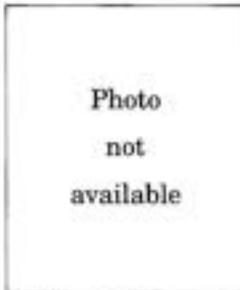
Barnes, Roxann D.



Beath, Susan M.



Blaise, Gilbert A.



Cai, Xuan (Joy)



Cook, David J.



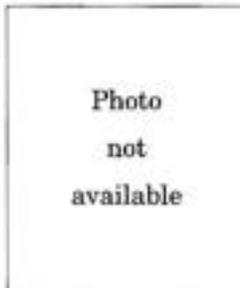
deCastro, Maria A.



Dickerman, David L.



Eskuri, Scott A.



Frenzel, John C.



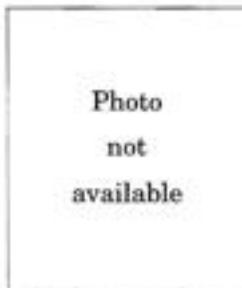
Kongsayreepong, Suneerat



Liam, Beng-Ling



MacVeigh, Ian



McQuarrie, Lamond G.



Namasiwayam, Thiru K.



Rehfeldt, Kent H.



Roth, Jeffrey L.



Sarpal, Rajbir S.



Sharp, William T.



Sischek, William J.



Stensrud, Paul E.



Torres, Norman E.



Trankina, Mark F.



Tricarico, Joseph D.



Weinlander, Chris M.

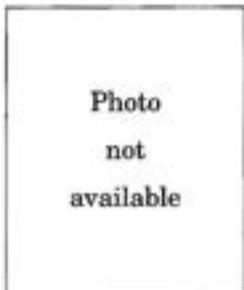
**Critical Care  
Medicine  
Anesthesia**



Bakondy, Ronald T.



Banoub, Ashraf F.



Beaumont, Timothy J.



Berge, Keith H.



Berger, Ines H.



Biswas, Iqbal H.



Blaise, Gilbert A.



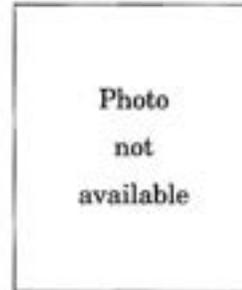
Cameron, Peter D.



Carton, Edmund G.



Chemtob, Gilles L.



D'Souza, Michael G.



DeRuyter, Martin L.



Divertie, Gavin D.



Eskuri, Scott A.



Findlay, James Y.



Gaumann, Dorothee M.



Green, Monica

Photo  
not  
available

Hargraves, Sharon



Harrison, Barry A.

Photo  
not  
available

Hee, Michael K. J.

Photo  
not  
available

Hennessy, Monica A.

Photo  
not  
available

Jacobsohn, Eric



Johnson, Scott S.



Jouma, Bashar N.



Kamath, Gerard S.



Kanazi, Ghassan E.



Keegan, Mark T.

Photo  
not  
available

Kongsayreepong, Suneerat



Kumar, Matthew M.



Kwek, Tong K.



Larson, Joel S.

Photo  
not  
available

Liopyris, Panayota



Lunn, Robert J.

Photo  
not  
available

MacVeigh, Ian



McMichan, John C.

Photo  
not  
available

Meadows, Diana P.



Morgan, Richard L.



Moukabary, Kamal F.



Mulhall, James J.



Ogan, Okoronkwo U.



Padakandla, Udaya B.

Photo  
not  
available

Papadimos, Thomas J.



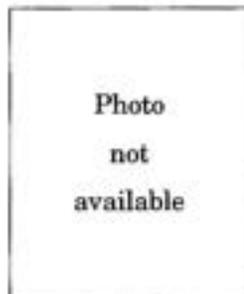
Patel, Samir K.



Peiris, Prith



Pullakhandam, Naga S.



Remolina-Schlig, Miguel



Rodenberg, Thomas J.



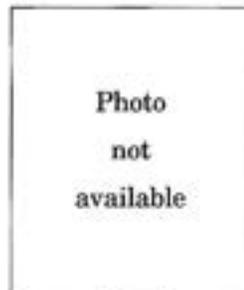
Rossi, Frank D.



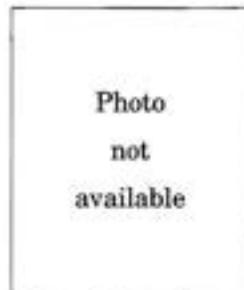
Ryan, Thomas A.



Saied, Nabel N.



Sampson, John S.



Simmons, Shawn T.



Sittipunt, Chanchai



Smithson, Kenneth G.



Stein, Susan K.



Tan, Kenneth H.



Tantivitayatan, Kamthorn H.



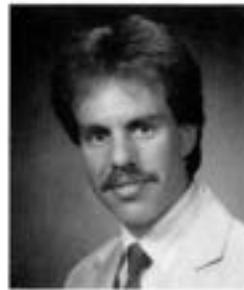
Torp, Klaus D.



Torres, Norman E.



Torsher, Laurence C.



Turnage, William S.



Vasdev, Gurinder M. S.



Wahi, Ravi



Wise, Lois



Ziser, Avishai

**Neuroanesthesia**



Bechtle, Perry S.



Black, Susan



Boudreaux, John K.



Christopherson, Thomas J.



Craft, Robert M.



Daltner, Carl J.



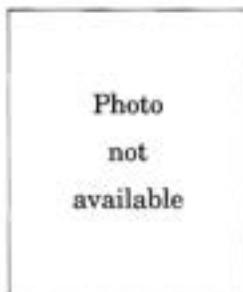
Dietz, Niki M.



Grady, Robert E.



Janik, Daniel J.



Lozada, Leonard J.



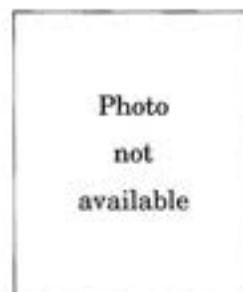
McKay, Robert D.



Mildo, Leslie N.



Muzzi, Donald A.



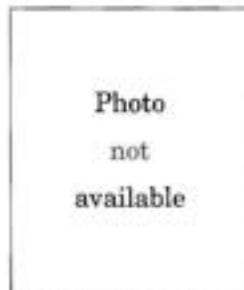
Pashayan, Annette G.



Polis, Tomasz Z.



Schwartzburg, Cynthia F.



Steinkeler, Jeffrey A.



Turner, Christopher R.



Wass, Charles T.



Wolin, Jessica A.



**Obstetric  
Anesthesia**



McQueen, Kathryn A.



Ransom, David M.



Rho, Edwin H.



Spriggs, Leclia E.



Sujirattanawimol, Kittiphong



Vasdev, Gurinder M.

**Pain  
Management**



Ammons, Evans E.



Benenfeld, Steven M.



Berger, Ines H.



Boortz-Marx, Richard L.



Bowers, Jasmine A.



Busch, Eric H.



Carey, John E.



Carns, Paul E.



Chowdhury, Susanti K.



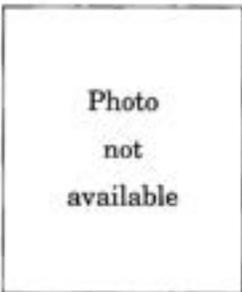
Christensen, Kert R.



Crecca, John D.



Crowl, Frank D.



Denham, Melody F.



Dubbink, Douglas A.



Gebhardt, Rodolfo



Gossler, Kenneth B.



Hatheway, John A.



Hilliard, Virgil A.



Jaconette, Andrew R.



Kinney, Michelle A.O.



Lederhaas, George



Mantilla, Carlos B.



Martin, Creston M.



Martin, David P.



Murphy, James P.



Nguyen, Thomas T.



O'Neill, Conor W.



Pfeffer, Susanne D.



Phillips, William J.



Powers, Christopher A.



Proper, Jacqueline A.



Robinson, Dean M.



Rodrigue, Renaud P.



Rogers, Stephen R.



Seamans, David P.



Shields, Sondra E.



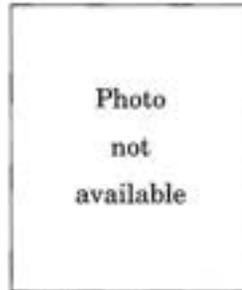
Siwek, Steven M.



Sood, Pardeep K.



Trentman, Terrence L.



Vick, Pamela G.



Wagner, Carl M.



Wagner, Stephen Robert



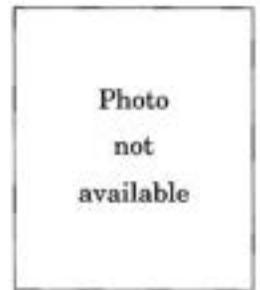
Wilson, Jack L.



Wong, Gilbert Y.



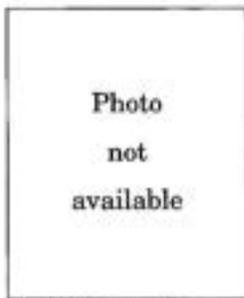
**Pediatric  
Anesthesiology**



Bejar, Miguel A.



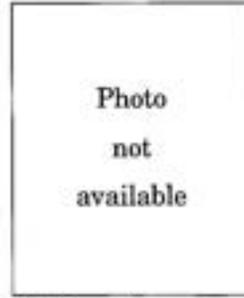
Gaver, Renee O.



Havidich, Jeana E.



Kim, Tae W.

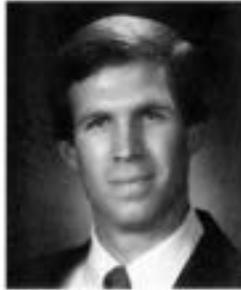


Ott, Karen D.



Worri, Betty

**Regional Anesthesia**



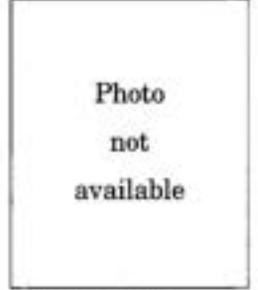
Atchison, Scott R.



Goldmann, Richard P.



Krohn, Jonathan S.



Meyer, Stephen J.



Wolin, Jessica A.

**Transplant Anesthesiology**



Lieberman, Noah



Torsher, Laurence C.

## Anesthesiology Residents

**Class  
of  
1925**



Carlton, Charles H.



Foote, Ovid C.

**Class  
of  
1926**



McCuskey, Charles F.

**Class  
of  
1927**



Moxon, Frank M.

**Class  
of  
1928**



Woodbridge, Philip D.

**Class  
of  
1929**



Patience, Cecil R.

**Class  
of  
1934**



Dunlop, John G.

**Class  
of  
1935**



Campbell, William A.



Tuohy, Edward B.

**Class  
of  
1936**



Tovell, Ralph M.

**Class  
of  
1937**



Adams, R. Charles



Hutton, John H.



Knight, Ralph T.

**Class  
of  
1939**



Betlach, Charles J.



Mousel, Lloyd H.



Searles, Paul W.



Wilson, Ira H.

**Class  
of  
1940**



Clark, Bertha M.



Delmonico, Edward J.



Seldon, Thomas H.

**Class  
of  
1941**



Barrett, Richard H.



Brown, Hugh O.



Nesi, Juan A.



Smith, Frederick A.

**Class  
of  
1942**



Abramson, Samuel R.



Adelman, Milton H.



Anderson, Bruce M.



Anderson, Charles D.



Ashburn, Frank S.



Swanson, Vincent F.



Tweedy, John A.

**Class  
of  
1943**



Baird, Joe W.



Ochsner, Albert J.



Whetstone, Stuart D.



White, John D.

**Class  
of  
1944**



Allen, Samuel L.



Gentling, Allen A.



Paulson, John A.

**Class  
of  
1945**



Alves, Luiz F.



Wilson, Thomas R.

**Class  
of  
1946**



Chapman, Carrie E.



Dos Santos, Hugo B.



Hardman, Anna B.



Hardman, William N.



Osborn, John E.



Pender, John W.



Storni, Mario P.C.



Thompson, Lynn W.

**Class  
of  
1947**



Clayton, Paul A.



Faulconer, Albert, Jr.



Guenther, Theodore A.

**Class  
of  
1948**



Crowley, James H.



Latterell, Kenneth E.



Peterson, John R.



Ridley, Roger W.



Schlotter, Donald C.



Toepfer, John B., Jr.

**Class  
of  
1949**



Brooks, Lowell M.



Ford, John L.



Johnston, Richard M.



Lykins, Robert W.



Morrison, A. Ervine



Yeakel, Earl L.

**Class  
of  
1950**



Courtin, Raymond F.



Fazio, Anthony N.



Flautt, James R.



Gehrig, John D.



Jones, Cecil S.



Jones, Robert R.



Keates, Albert E.



Morton, Glenn H.



Winchester, Elsie C.



Zagaria, James F.

**Class  
of  
1951**



Devloo, Robert A.



Eyvindsson, Elias T.



Hattox, John S.



Massa, David J.



Roberts, Stanley E.



Soltero, Donald E.



Uzmann, John W.

**Class  
of  
1952**



Abbott, Albert R.



Gronquist, Yrjo K.



Hunter, Robert C.



Kiersey, Donald K.



Knutson, Robert C.



Patrick, Robert T.



Possati, Serafino



Richards, Frances M.

**Class  
of  
1953**



Doerr, John C.



Francisco, Patrocinio A.



Gillies, Alastair J.



Narouze, George S.



Schnugg, Francis J.



Svigals, Robert E.



Wentzler, James D.

**Class  
of  
1954**



Fletcher, Grant



Gharib, Ali



Randall, Alan D.



Redelfs, John W.

**Class  
of  
1955**



Cattaneo, Angelo D.



Crouch, Boyden L.



Fieldman, E. Jay



Hicks, Shelby L.



Kopecky, Frank A.



Paletz, Solly G.



Taylor, Harry E.



Thompson, Murray C.



Walker, Jack A., Jr.

**Class  
of  
1956**



Hansen, Robert H., Sr.



Hartridge, Virginia B.



Knight, James H.



Lalevic, Prodrag B.



Reyes De Castro, Luisita



Spoerel, Wolfgang E.



Terry, Howard R., Jr.

**Class  
of  
1957**



Bjarnason, Valtyr



Buck, Conrad C.



Moffitt, Emerson A.



Waterfall, Joan M.

**Class  
of  
1958**



Gould, Allan B., Jr.



Higgins, John E.



McCammon, Joseph



Metzertott, Kirk O.



Parkhouse, James

**Class  
of  
1959**



Brungardt, Bernard A.



Daw, Edward F.



Dawson, Brian



Lau, George L.



Restall, Charles J.



Sandeno, Morris T.



Schnelle, Norbert

**Class  
of  
1960**



Wuerth, Felix

**Class  
of  
1961**



Ashmore, Herbert C.



Crennell, Ean H.



Dalton, Timothy T.



Damron, John C.



Fatum, Paul J.



Glover, William J.



Krabill, Donald R.



Leonard, Vivita K.



Michenfelder, John D.



O'Neill, Nial C.



Rehder, Kai



Verrill, Peter J.



Wenthe, Fritz M.

**Class  
of  
1962**



Albin, Maurice S.



Cichosz, Kenneth J.



Sessler, Alan D.



Smith, Martha A.



Tuohy, Gerald F.

**Class  
of  
1963**



Anderson, Gerald J.



Byerly, Walter H.



Leonard, Paul F.

**Class  
of  
1964**



Carney, Françoise M.



Del Castillo Zuniga, Jesus A.



Furman, Philip J.



Gattiker, Ruth I.



Lower, Alfred H.



Takeshita, Hiroshi



Wagner, Christian J.

**Class  
of  
1965**



Hochman, Richard A.



Judson, Graham



Lundborg, Richard O.



Tarhan, Sait

**Class  
of  
1968**



Garcia, Eduardo



Magnant, Henry A.



Messick, Joseph M., Jr.



Townsend, Clary H.

**Class  
of  
1969**



Wang, Josef K.



Altenburg, Bernard M.



Antlfinger, Thomas J.



Erbguth, Peter H.



Hatch, David J.



Horreht, Otto H.



Jaeger, John G.



Lee, Ju H.



Magnant, Claude D.



Muldoon, Sheila M.

**Class  
of  
1970**



Fortman, Albert H.



Gildersleeve, John W.



Papagni, Mario B.



White, Roger D.

**Class  
of  
1971**



Adams, Robert W.



Cullen, John W.



Korten, Klaus W.



Lantz, James P.



Maduska, Albert L.



Marsh, H. Michael



Morrison, James D.

**Class  
of  
1972**



Arbon, Douglas H.



Lewis, John M.



Mathison, Robert D.



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not  
available

Parker, Robert W.



Raimundo, Hugo S.



Rodriguez-Rivera, Ramon



Sittipong, Rungson

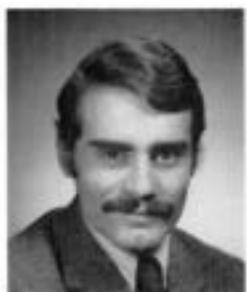
**Class  
of  
1973**



Byer, David E.



Cucchiara, Roy F.



Olivencia, Jose



Pien, Harriet H.



Rorie, Duane K.



Whitehouse, James S.

**Class  
of  
1974**



Abboud, Nabil



Brown, Celia F.



Brzica, Stephen M., Jr.



Cant, Wilbur F.



Dizon, Grace D.



Edelman, Jerry D.



Fibuch, Eugene E.



Gholkar, Vijay R.



Kumar, Surendra M.



MacKenzie, Ronald A.



Mallow, James E.



Nauas, Lee A.



Nelson, David O.



Southorn, Peter A.



Stehr, Christian H.



Venegoni, Robert L.



Wiggins, Thomas M.

**Class  
of  
1975**



Faust, Ronald J.



Gallagher, Michael B.



Juno, Philip



Lalor, Carmella C.



Landmark, Sandra J.



Marx, James G.



Moriarty, Denis C.

**Class  
of  
1976**



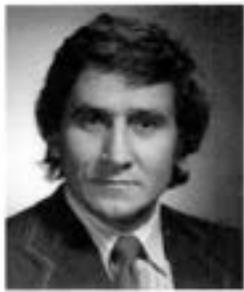
Glenn, John J.



Hatoum, Bechara



Kopacz, Maciej J.



Merzliakov, Serge



Okwuje, Philip C.



Olson, Barry D.



Ormrod, Jean



Pinkerton, Bruce C.



Prasertwanitch, Yupadi



Preiss, Dieter-Ulrich



Stullken, Edward H., Jr.



Widger, Lorry A.

**Class  
of  
1977**



Baillie, Nigel M.



Baxter, John A.



Beynen, Froukje M.K.



Gindt, Henry S.



Hughes, James J.



Marx, William L., Jr.



Mc Michan, John C.



Steen, Petter A.



Zuazu, Marcos A.

**Class  
of  
1978**



Baggenstoss, Gary A.



Belatti, Richard G., Sr.



Finley, Dyke W.



Hacker, Robert J.



Jeroy, Harry K.



Krueger, Kurt A.



Loberg, Douglas J.



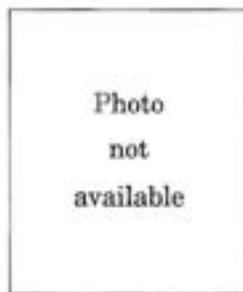
Magdaick, John C.



Michel, Luc



Norrie, Thomas K.



O'Leary, Michael J.



Rich, Charles R.



Slosburg, John P.



Srichomkuan, Thara



Voehl, Valerie



Wilson, Peter R.

**Class  
of  
1979**



Artro, Alan A.



Fromme, Glenn A.



Haidinyak, John G.



Janossy, Theodore A.



Jevric, Nicholas



Johnson, Robert F., Jr.



Kulesza, Andrew J.



McCreary, Richard B.



Mullan, Robert J.



Parker, Kim E.



Sill, J. Christopher



Sperry, Mark S.



Uncapher, William W.

**Class  
of  
1980**



Garwin, Mark J.



Gaudzels, George M.



Hall, Philip L.



Larsen, George K.



Nobuck, Carl R.



Reeves, Keith W.



Rippoteau, Nicki D.



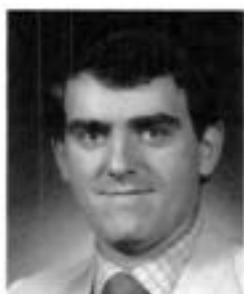
Somboonviboon, Wanna



Spackman, Thomas N.



Waldman, Steven D.

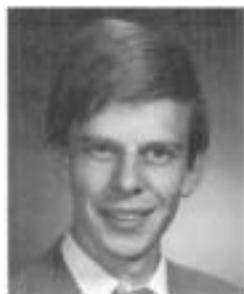


Wallace, Stephen A.



Warner, Mark A.

**Class  
of  
1981**



Baele, Philippe L.



Bode, Eugene T.



Bowers, Betty A.

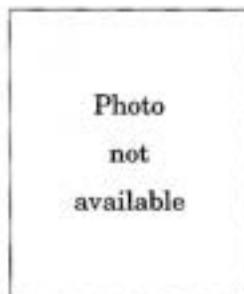


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not  
available

Hammond, Jennifer S.



Jones, Mark W.



McCurdy, Norman H.



Mears, John H.



Nugent, Michael



Pease, Rodney D.



Stearns, Richard M.



Wedel, Denise J.

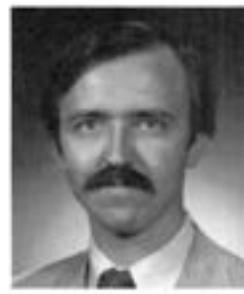
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of  
1982**



Billings, John A.



Chantigian, Robert C.



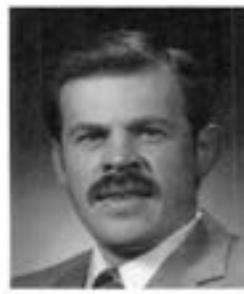
Christianson, Lynn A.



Darwish, Hussain M.



Hughes, David R.



Lennon Robert L.



Lunn, Jeffrey J.



Martinson, Mark W.



Rettke, Steven R.



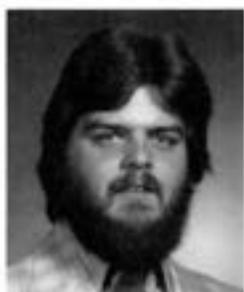
Swagman, William G.



Weaver, Mark E.



Weinmeister, Kent P.

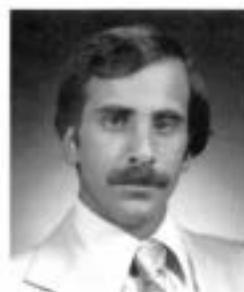


Wiesemeyer, Danny L.



Zievers, Paul C.

**Class  
of  
1983**



Alessi, Thomas R.



Baltz, Timothy J.



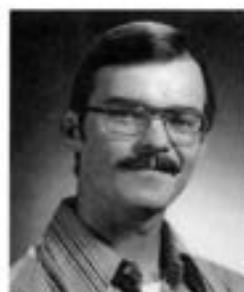
Boeke, Gary A.



De Boer, C. Gwen



German, James D.



Gray, John R.



Horner, William J.



Housmans, Philippe R.



Kiviniemi, Jan



Kunkel, Steve E.



Spiess, Bruce D.



Swenson, Stephen S.



Warner, Mary E.



Wegrzynowicz, Edward S.

**Class  
of  
1984**



Alvarez, Julian A.



Atchison, Scott R.



Bagby, Jack M., Jr.



Bailey, Stephen P.



Bowman, Daniel J.



Boyle, Philip F.



Cameron, Peter D.



Crawford, Matthew R.



Glenaki, James A.



Healow, David G.



Lanier, William L.



Mc Gregor, Randall K.



Olson, Richard A.



Plevak, David J.



Rose, Steven H.



Steidl, Lester J.

**Class  
of  
1985**



Axness, Mark E.



Belatti, Richard G., Jr.



Carlson, James L.



Casement, Brian A.



Eisenach, James C.



Elliott, Beth A.



Endres, Stephen M.



Everson, Ralph W.



Prith, Helen M.



Golfus, Gene R.



Grinton, Nancy N.



Humphries, Craig L.



Laughlin, Thomas P.



McDonald, Michael G.



Narr, Bradly J.



Robertson, Kent A.



Schumacher, Kathryn A.



Shine, Timothy S.



Sorenson, Arne C.



Stangland, Kenneth J.



Sucha, Daniel E.



Wiecks, Michael J.

**Class  
of  
1986**



Applegate, Richard L., II



Bakke, Allan P.



Black, Susan



Bravo-Fernandez, Caridad



Bryco, David A.



Fleischer, Jerry E.



Halma, Gary A.



Heuermann, Laurie L.



Hool, Geoffrey J.



Lamer, Tim J.



Lilley, Jean P.



Liu, Paul H.



Merridew, Colin G.



Murray, Michael J.



Roseberg, John N.



Weeks, Janis L.



Wilkowski, Deborah Ann W.

**Class  
of  
1987**



Bell, Douglas G.



Berge, Keith H.



Bullock, Alan R.



Conover, Margaret A.



Conterato, James P.



Gibbons, James J.



Keppen, Bruce W.



Kerchberger, John P.



Oliver, William C., Jr.



Frankina, Mark F.



Viani, Bruce A.



Villamaria, Frank J.



Wadle, David P.



Walther, Henry C.



Warner, David O.

**Class  
of  
1988**



Brockman, Steven K.



Divertis, Gavin D.



Durant, Philippe A.



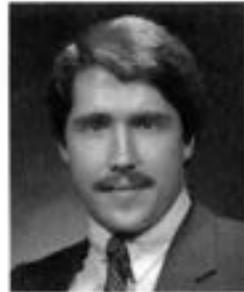
Evans, Charles W.



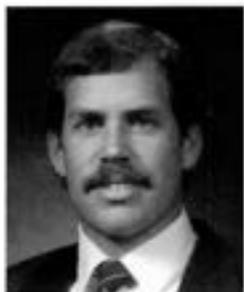
Grigsby, Eric J.



Houck, Peter C.



Hughes, Joseph M.



Larson, Joel S.



Lunn, Robert J.



Marnach, Richard L.



Meadows, Diana P.



Meisner, Judith M.



Ockert, Doris B.



Ritter, Dennis M.



Welna, Jeffrey O.



Witzeling, Todd M.



Wolff, Paul R.

**Class  
of  
1989**



Ereth, Mark H.



Friedhoff, Robert J.



Horlocker, Terese T.



Hosking, Michael P.



Johnson, Michael E.



Losasso, Thomas J.



Mundhenke, Jeffrey A.



Perkins, William J., Jr.



Pettis, Michael S.



Ronan, Kevin P.



Tse, Paul



Weglinski, Margaret R.

**Class  
of  
1990**



Bergstrom, Kristin C.



Bertha, Brian G.



Dieringer, Norbert J.



Hall, Brian A.



Hess, Todd M.



Hofer, Roger E.



Jefferson, Michael K.



Johnston, Sharon R.



Jones, Keith A.



Lutz, Lon J.



Nuttall, Gregory A.



Sander, Joseph J.



Scott, Kenneth P.



Turnage, William S.



Venneman, Charles R., II



Wernz, Eric

**Class  
of  
1991**



Binegar, William G.



Birch, Warren A.



Cook, David J.



de Castro, Maria A.



Dubbink, Douglas A.



Gammel, Scott A.



Jaax, Jeffrey D.



Lee, Theresia L.



Lobdell, Creig M.



Stensrud, Paul E.



Van Beck, Jerald O.



Wallender, Wayne H.



Weber, Mary B.

**Class  
of  
1992**



Assef, Saied J.



Barhorst, Mark D.



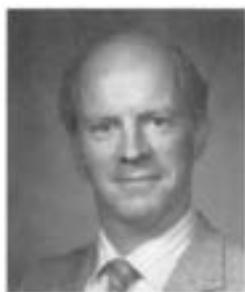
Bishop, Michael L.



Bundy, Pamela J.



Christopherson, Thomas J.



Davis, William J.



Dietz, Niki M.



Erie, John K.



Eskuri, Scott A.



Gott, Stephen T.



Hee, Michael K.



Joyner, Michael J.



Kerr, Brian C.



Lockwood, Scott A.



Mc Gregor, Diana G.



Mortensen, James M.



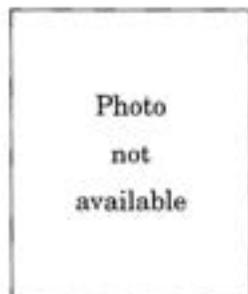
Mumme, David R.



Rajala, Mary M.



Stapelfeldt, Wolf H.



Stuckey, Mark W.



Van Erdewyk, John M.



Winikur, Lawrence J.

**Class  
of  
1993**



Becker, David R.



Berger, Ines H.



Caswell, Renee E.



Crocca, John D.



DeRuyter, Martin L.



Engel, Ann K.



Green, Monica A.



Hubbell, Paul J., III



Kufner, Ronald P.



Marshall, Kenneth A.



Martin, Patricia A.



Mc Cord, Michael D.



Mergens, Pamela A.



Proctor, Lance A.



Reed, Karen S.



Shields, Sondra E.



Spriggs, Lecia E.



Stinson, Lawrence W.



Taylor, Michael D.



Thomson, Cynthia A.



Torres, Norman E.

**Class  
of  
1994**



Albrecht, Mitchell D.



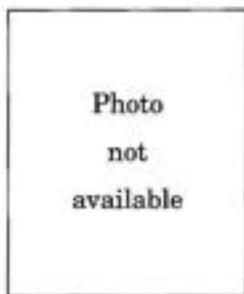
Bluestein, Linda S.



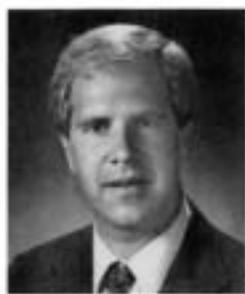
Chowdhury, Susanti K.



DeRuyter, Marie L.



Deik, Michael L.



Dodd, Jesse R.



Farrell, Kenneth J.



Hall, Jerry A.



Hannon, James D.



Holmgren, Bryce C.



Islam, David M.



Johnson, Scott S.



Nellans, Frank P.



Newcome, John P.



Ransom, David M.



Trentman, Terrence L.



Vasdev, Gurinder M.



Weber, Joseph G.



Wong, Gilbert Y.

**Class  
of  
1995**



Ziser, Avishai



Albrecht, Allison



Albrecht, Ronald F., II



Buelvas, Raul S., Jr.



Carey, John E.



Chudomelka, Patricia J.



Dahlberg, Thomas K.



Findlay, James Y.



Foster, Stephen M.



Gray, Pamela E.



Grayden, Edward N.



Hagstrom, Alan K.



Haynes, Howard S.



Heise, Julie W.



Hough, James B.



Jacobson, Eric



Kongsayreepong, Suneerat



Layne, Stephen K.



Leeds, Philip B.



Liu, Christine Min-Nan



Maccani, Robert M.



Martin, Creston M.



McQueen, Kathryn A.



Mueller, Jeff T.



Ness, Daniel A.



Potts, Fred E., IV



Psomas, Maria N.



Schlichting, Joyce L.



Tuohy, Stephen E.



Wendell, Christopher J.

**Class  
of  
1996**



Allaire, Patrick H.



Banjac, Borislav



Barnes, Roxann D.



Buelvas, Raul S., Jr.



Causton, Paul R.



Cohen, Jonathan D.



Donahue, Brian S.



Drewsen, Lawrence D.



James, Michael E.



Kor, Todd M.



Loveless, Douglas M.



Martin, David P.



Matsushige, Derek K.



Mc Glinch, Brian P.



Odell, John A.



Schroeder, Lawrence E.



Smithson, Kenneth G.



Wagner, Stephen Robert

**Class  
of  
1997**



Booton, Derek V.



Carns, Paul E.



Frie, Edward D.



Gaspari, Jack C.



Han, John Y.



Jankowski, Christopher J.



Martinez, Angel, III



Meier, Michael M.



Munce, David B.



Nelson, Scott G.



Peiris, Prith



Roberts, Christopher



Salahi, Ismail D.



Sanders, Malcolm S.



Sood, Pardeep K.



Tople, Ray A.



Torp, Klaus D.



Waggoner, Julian R., III

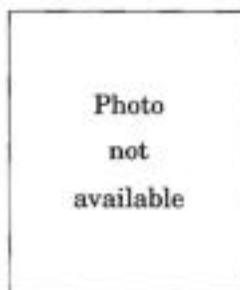


Zepeda, Fernando A.

**Class  
of  
1998**



Anderson, Kami K.



Balderas, Raquel



Bechtel, Perry S.



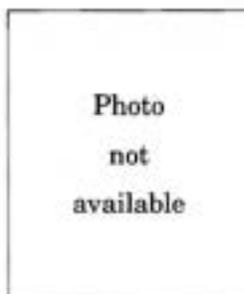
Blaschak, Daniel P.



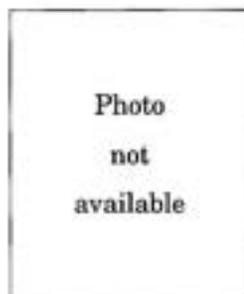
Burkle, Christopher M.



Clendenen, Steven R.



Coleman, Robyn G.



Cregan, John D.



Cunningham, Scott T.



Dacaji, Joseph S., Jr.



Hayes, William B.



Hogg, Malcolm N.



Jandik, Wayne R.



King, Melinda A.



Kinney, Michelle A.O.



Knutsen, Feder N.



Long, Timothy R.



Mantilla, Carlos B.



Peecher, Matthew L.



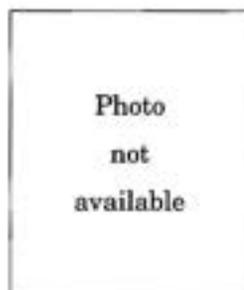
Reynolds, Bret A.



Rho, Edwin H.



Seamans, David P.



Siwek, Steven M.



Whatcott, Brett D.



Wolfe, John D.

**Class  
of  
1999**



Amune, Evans E.



Benenfeld, Steven M.



Botts, John T.



Brown, Michael J.



Chapman, Mark K.



Christensen, Kort R.



Hall, Denver R. Jr.



Hebl, James R.



Hecht, Sandra K.



Keegan, Mark T.



Kuhnert, Scott M.



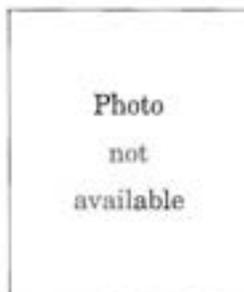
Leonovitz, Brian M.



Lumpkin, Elizabeth N.



Mc Cardell, Craig S.



Pace, Charles F.



Powers, Christopher A.



Proper, Jacqueline A.



Rehfeldt, Kent H.



Robinson, Dean M.



Sayeed, Faisal A.



Spielmann, John M.



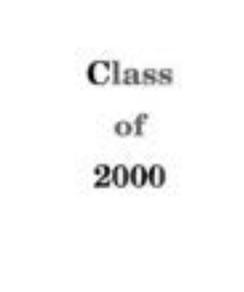
Thompson, Matthew D.



Wang, Linda H.



Wen, Deyong



**Class  
of  
2000**



Alexander, Jeffrey M.



Belmont, Richard E.



Burns, Gordon T.



Dobbertin, Alexander



Doskey, Paul M.



Gebhardt, Rodolfo



Jaconette, Andrew R.



Liszka-Hackzell, John J.



Marak, Barbara A.



Pfeffer, Susanne D.



Rho, Richard H.



Rossi, Frank D.



Sujirattanawimol, Kittiphong



Zaner, James T.

**Class  
of  
2001**



Ball, Stephen C.



Beaudrie, Michael L.



Butkiewicz, Kyle J.



Chini, Eduardo N.



Dado, Robert J.



Duong, Vu H.



Engel, Andrew C.



Erickson Wilson, Kirstin M.



Etzel, Eric D.



Kent, Jay E.



Lindsey, Brad L.



Novinska, Brian D.



Nymeyer, Lincoln

Class  
of  
2002



Phuong, Mary Jennifer Y.



Sabers, Candace J.



Brower, Marc C.



Chamblee, Brian B.



Church, Eric J.



Clarke, Scott H.



Contreras, Michael G.



Cote, Annie V.



Doust, Matthew W.



Eisenach, John H.



Ellis, Terry A., II



Johnson, Michael M.



Kim, Daniel U.



Kuipers, Brian G.



Lam, Hong R.



Martini, Joshua A.



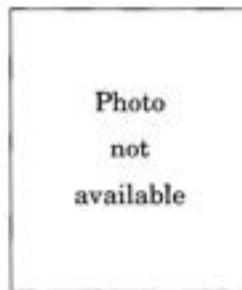
Mauck, William D.



Pasternak, Jeffrey J.



Schwartz, Josef



Scott, Susan J.



Spittler, Karl Heinz



Tax, Michael J.



Webel, Nicole E.



West, Aaron J.

**Class  
of  
2003**



Bergman, Bradley D.



Gordon, Eric A.



Halverson, Jerry L.



Hieb, Gregory D.



Husser, Casey S.



Kopp, Sandra L.



Mayo-Hilgenberg, Molly



Mohacsi, Tibor G.



Navratil, James E.



Obray, Jon B.



Pabelick, Christina M.



Ray, Deella A.



Sekulic, Aleksandar



Stoehr, Karrin L.



Tully, Michael J.



Vachon, Claude A.



Woodward, Kenneth A.

## 1970 Consultant Group

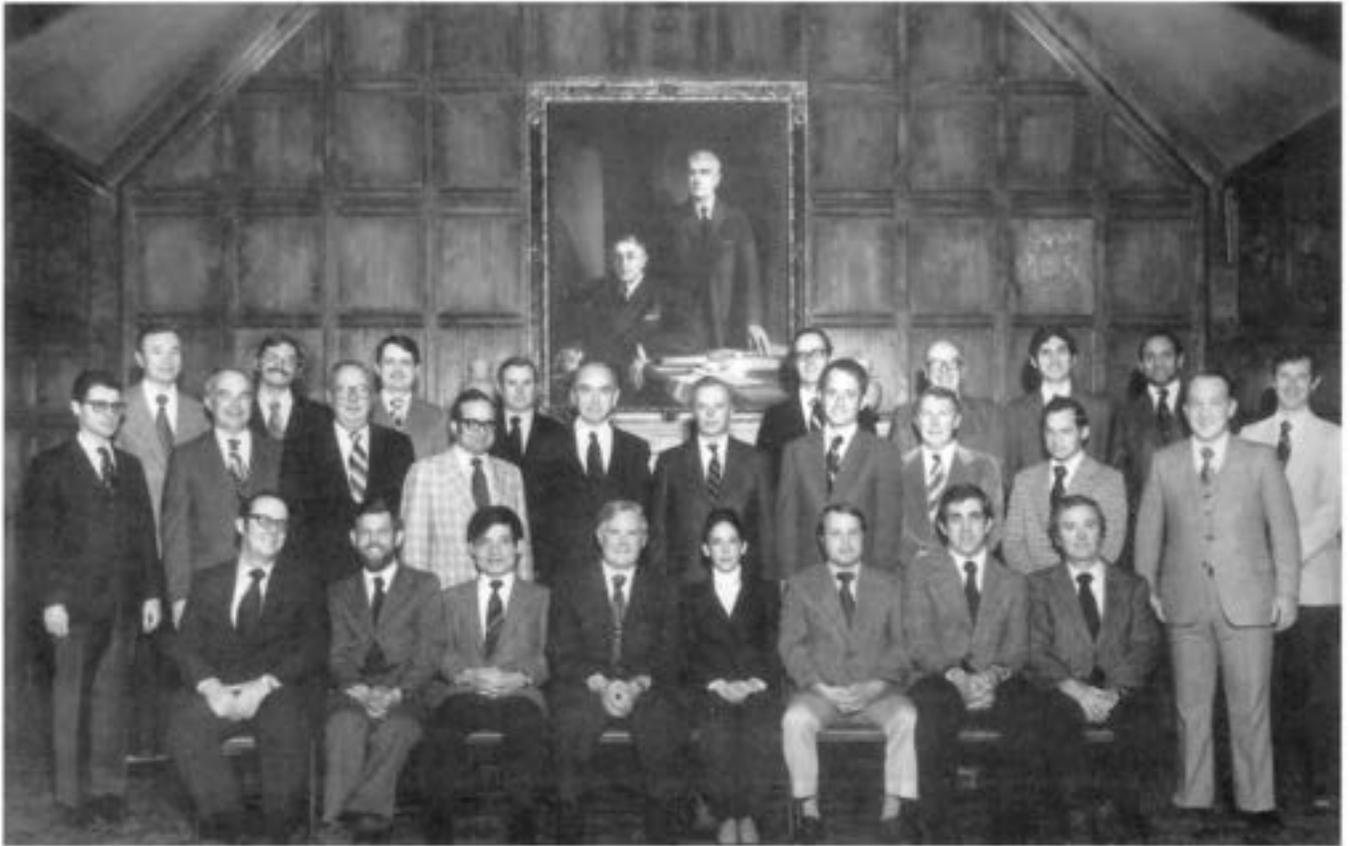


*Front, left to right: Drs. Jones, Devloo, Paulson, Moffitt, Seldon, Faulconer, Martin, Gould, Restall, Didier, Hartridge.*

*Back, left to right: Drs. Dawson, Muldoon, Schnelle, Tarhan, Rehder, Kimmel, Krabill, Leonard, Lundborg, Sessler, Messick, Perry, Carney.*

*Absent: Drs. Gronert, Michenfelder, Theye.*

# 1977 Consultant Group

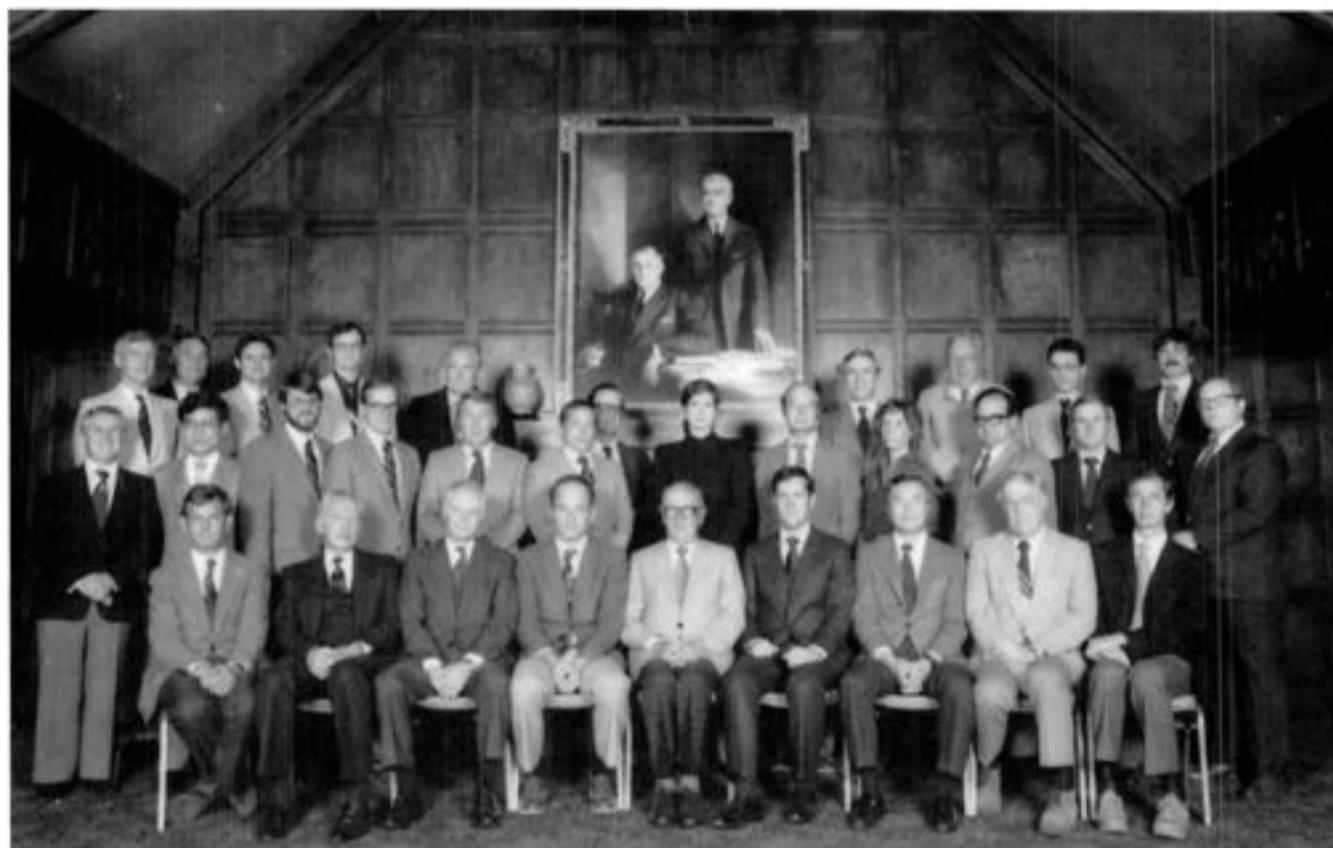


*Back row, left to right: Drs. Tarhan, White, Prentice, Rorie, MacKenzie, Schnelle, Cucchiara, Raimundo, Gronert.*

*Middle row, left to right: Drs. Messick, Gould, Krabill, Byer, Leonard, Sessler, Faust, Perry, Nauss, Mr. Smith.*

*Front row, left to right: Drs. Tinker, Southorn, Wang, Rehder, Carney, Nelson, Brzica, Didier.*

# 1982 Consultant Group



*First row, left to right:* Drs. Southorn, Michenfelder, Sessler, Faust, Schnelle, Janossy, Tarhan, Van Dyke, Gronert.

*Second row, left to right:* Drs. Dawson, Wang, Fromme, Danielson, Perry, Rettke, Wedel, Sill, Newberg, Byer, Rorie, Martinson.

*Third row, left to right:* Dr. Wilson, Mr. Kokesh, Drs. Warner, Gray, Rehder, Tinker, McMichan, Krabill, Messick, Kiviniemi.

## 1988 Consultant Group



*Front row, left to right:* Drs. Plevak, Tarhan, Faust, Southorn, Marsh, Sessler, Michenfelder, Messick, Van Dyke, Nauss, Byer.

*Second row, left to right:* Drs. Conover, Ockert, Rettke, Cucchiara, Spackman, Abel, Lunn, Bires, Feinglass, Villamaria, Mary Ellen Warner, Mark Warner, Lamer, Milde, MacKenzie.

*Third row, left to right:* Drs. Muzzi, Wedel, Mr. Wells, Drs. Wilson, Sittipong, Rorie, Lennon, Rose, Housmans, Bell, Chantigian, Rehder.

*Back row:* Drs. Witzeling, Didier, Raimundo, Larson, Lanier, Murray, Grigsby, Narr, Janossy, Gould, Mr. Kokesh, Drs. Lindahl, Welna.

# 1998 Consultant Group



*Front row, left to right:* Drs. Berger, McGregor, Abel, Sieck, Jones, Rorie, Weglinski, LeBard, Abenstein, Dietz, DO Warner.

*Second row, left to right:* Drs. Barnes, Grady, Martin, Rettke, Chantigian, ME Warner, Horlocker, Jankowski, Findlay, Friedhoff, Hofer, Torres, Hannon, MA Warner.

*Third row, left to right:* Drs. Sill, Wass, Harrison, Boortz-Marx, Wong, Hall, Perkins, Faust, McGlinch, Katusic, Ereth, Kamath, Sanders, DeRuyter, Byer, Cook.

*Fourth row, left to right:* Drs. Räsänen, Housmans, MacKenzie, Lanier, Johnson, Joyner, Murray, Narr, Torsher, Berge, Plevak, Mr. Brigham, Dr. Vasdev.

Members of the Mayo Clinic department of anesthesiology participated in many significant developments, discoveries, and made important contributions. Some of these are documented on the back cover.

School of Respiratory Therapy

Venous Air Embolism

Regional Anesthesia Techniques

Pentothal

Intrathecal Morphine

Anesthesiology

Anesthesia and Myocardial Infarction

Mechanical Ventilation

Anesthesia and Analgesia

Plastic Needle

Halothane Metabolism

EEG and Anesthesia Levels

Post Anesthesia Recovery Room

Malignant Hyperthermia

ASA, MSA, AUA

Blood Conservation and Blood Banking

Mayo Logo

Nurse Anesthetists

Esophageal Stethoscope

Profound Hypothermia

American Board of Anesthesiology

Balanced Anesthesia

Electrical Safety

Acoustic Gas Analyzer

Extracorporeal Circulation

Pheochromocytoma