The long-term members of the division are Drs. Beth Elliott, James Hannon, and Steve Rose. Dr. Elliott served as division chair for ten years and has been medical director of the Nurse Anesthesia Program in Mayo School of Health Sciences since 1991. Dr. Hannon has made impressive contributions in basic scientific research in addition to his clinical work and is an accomplished distance runner. Dr. Rose has served as program director of the Anesthesia Residency Program since 1994 and was more recently appointed Associate Dean for Surgery and Surgical Specialties at Mayo School of Graduate Medical Education.

Dr. Michael Brown, who is chair of the Central Division, and Drs. Tim Long and Tom Wass are members who have received awards for excellence in both clinical care and education including "Teacher of the Year," "Distinguished Clinician," and "Distinguished Educator" honors. Tim and Mike actively pursue a broad range of sports including basketball, football, golf, and swimming. They eagerly await the Wisconsin vs. Michigan football game to determine office bragging rights. Tom is an avid cyclist and, every July, is glued to the computer determining how many seconds Team Discovery is ahead of the peloton.

Central boasts several other productive researchers as well. Dr. Eduardo Chini is an accomplished scientist with original contributions published in high-quality journals. In his free time, Eduardo spends time with his children, preparing them for team Brazil's World Cup entry in 2014 . Dr. John Eisenach is active in Mike Joyner's physiology lab and has obtained dedicated extramural funding for his research.

The newest members of the division include Drs. Tim Curry, Daryl (DJ) Kor, and Y. S. Prakash. Tim is a M.D./Ph.D. with ongoing research activities in physiology. Prakash started the residency as an Associate Professor at Mayo, having worked in the anesthesiology research laboratory for several years before medical school. DJ completed a Critical Care Medicine fellowship and is widely regarded as one of the most talented and energetic persons we have ever trained.

An obvious factor in the success of the division is working well together as a team, valuing each other as physicians and friends coupled with a sincere desire to advance the department across a wide front. We look toward the future with great enthusiasm based on the talent and industry of the members of the group.

## Mayo ala Gerald A. Gronert

**Gerald Gronert, M.D., Albuquerque, New Mexico**

Mayo was first mentioned when I was a 20-hour/week lab tech during my medical school years at the University of Illinois Medical School, Chicago. My endocrine physiologist boss was unhappy with the Nobel award to Mayo -- she bemoaned the fact that the award had not been awarded to Hans Selye who had laid the groundwork for stress theories and cortisone functions. Selye, forward and obnoxious, had likely ruined his own chances.

After residency and five years of private practice in Denver, I visited Mayo to attend a cardiac surgical conference with a Denver cardiac surgeon. While there, Saint Marys' anesthesia chief, Emerson Moffitt, offered me a position with opportunities for teaching and research. We moved to Rochester in August, 1966. Others arriving at that time included fellows Joe Messick and Sheila Muldoon and my medical student preceptee Roy Cucchiara. Neuroanesthesia was to occupy 18 of my 20 years at Mayo. In this period, we performed a variety of clinical research including helping define the use of Doppler ultrasound to detect air embolism. I still have the original audio tape of patients' air embolism episodes. I

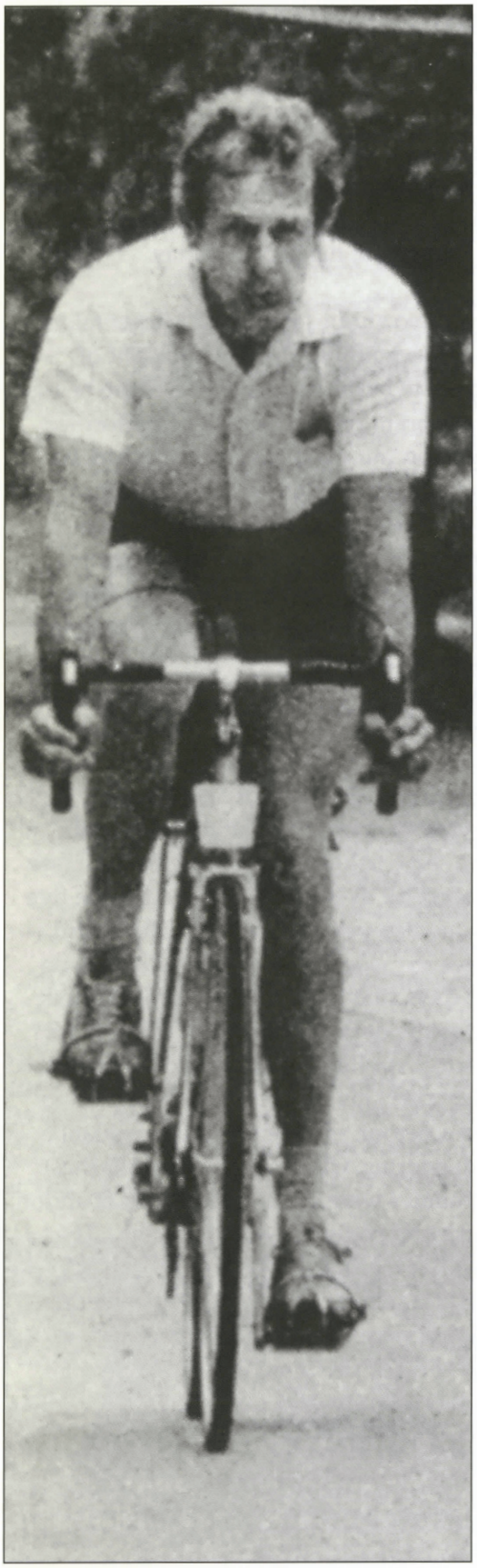

*Photo from* Post-Bulletin *article about Dr. Gronert's commute to work along the Douglas Trail (see text).*

enjoyed teaching and was selected as "Teacher of the Year."

In 1967, I was drafted and assigned to the US Army burn unit in San Antonio. Our basic training at Camp Bullis included wriggling under fences in sand and sand burrs while 50 mm machine gun fire blasted 18 inches over our heads (no helmets), once in the afternoon and again after dark, so we could see the tracers.

My first burn unit publication concerned giving halothane anesthetics every four days to permit debridement or grafting. Halothane did not alter hepatic function even after ten to twenty anesthetics.

At that time, succinylcholine (SCh) was under a vague cloud regarding the probability that it could cause cardiac arrest when used in patients with thermal trauma. This problem was solved by the landmark report of Tolmie, Joyce, and Mitchell regarding a burn patient in Vietnam. They demonstrated that SCh caused extreme hyperkalemia. Others found that same problem in patients with specific motor neurological deficits including direct muscle trauma. This response was due to proliferating extra-junctional acetylcholine receptors.

We studied SCh in burn unit patients and outlined patterns of potassium response following burns. Previously healthy adult patients with severe burns lost 40-60 pounds during convalescence. The burn-related hyperkalemic response developed in seven to ten days after the burn and returned to normal when the patient was doing well, gaining weight, and becoming mobile, generally after about two months. Patients with motor neurological deficits or direct muscle trauma developed the hyperkalemic response to SCh about four days after injury. Their recovery to normal depended on the type of lesion. If the muscle healed or totally atrophied with time, there was no abnormal muscle to respond to SCh and no hyperkalemia. With upper motor neuron lesions such as produced by stroke or spinal cord transection, the muscle was viable and the hyperkalemic response could be permanent. The muscle in patients at risk to SCh hyperkalemia also became resistant to non-depolarizing muscle relaxants at the same time. My supposition is that a return to a normal response for non-depolarizers indicates a reversal of the hyperkalemic response to SCh.

When I returned to Mayo in 1969, I wanted to see why burn patients with only skin burns developed a muscle-related sensitivity to SCh. The burn literature suggested a pig model due to its human similarities. Dick Theye was my mentor and was superb, focusing on logic and objectivity. The Animal Care Committee reluctantly approved the study. On our first day, several researchers assembled in the hall outside Dick's laboratory to prevent the study. Dick, as was his reputation, cruelly, crudely, and profanely dispersed them. Jim Milde, Dick Koenig, Becky Wilson, Bill Gallagher, and Marilyn Oeltjen were capable techs. Pigs were anesthetized and their backs briefly dipped into hot water to produce discrete full thickness burns. These burns were painless because there was no second degree burn. I washed them twice a day and covered the wound with sulfamylon. No pigs became infected or died;

they were not in pain, they ate well, and they gained weight. We failed in that hyperkalemia did not occur during halothane/SCh anesthesia. We succeeded in providing a laboratory home barbecue (which was acceptable in that era)!

Our next project determined the amount of potassium released from skeletal muscle when exposed to SCh. We measured potassium release in four canine gastrocnemius skeletal muscle preparations: normal, following a month-long denervation (sciatic section), a T 6 spinal cord section, or disuse atrophy (produced by casted immobilization of the pelvis and one hind limb). We measured total blood flow across the muscle and determined oxygen consumption and potassium release. Potassium release was huge following denervation and cord section. A well-regarded Medical Intelligence article summarized this field.

One of our burn pigs developed malignant hyperthermia (MH), opening another research window. Jim Milde, Bill Gallagher, Dick Koenig, and I brought oxygen, halothane, dantrolene, and bicarbonate to the farm of a Poland China pig farmer. We identified MH-sensitive pigs by their rigidity when breathing halothane, and if their response went too far, we gave dantrolene and bicarbonate via the huge porcine ear veins. Our early studies, in addition to those of others, defined increases in oxygen consumption and lactate production that occurred in this condition. Our varied studies of MH included muscle contracture data that identified susceptible pigs and humans. Another of Dick Theye's research approaches provided the means to determine MH responses of various organs, e.g., muscle, brain, heart, liver and gut, sympathetic nervous system. Only muscle and lymphocytes were involved in the MH mutation. Dick unfortunately died in the fall of 1977 from the bulbar form of amyotrophic lateral sclerosis. Our review of MH was published in 1980.

In June 1981, Thor Sundt, the incredible neurosurgeon and one of my two heroes in life, Bob Lennon, and I cared for a young woman with an intracranial aneurysm who, pregnant, had a simultaneous C section and aneurysm clipping. She did well overall, as did her son, and we have maintained contact, most recently at his 25th birthday.

Other Mayo studies with Jack Michenfelder included examining the development of tolerance to barbiturates, as they were being used for brain protection. I also performed research on muscle disuse atrophy and, its converse, exercise fitness conditioning. Both of these altered the potency of non-depolarizing muscle relaxants: disuse increased it and exercise reduced it. This seemed to be related to numbers of endplate acetylcholine receptors. Mayo added funds to my NIH grant which helped immeasurably to accomplish my research.

In February, 1979, I took up cycling and began an everyday commute of 34 miles round trip on the crushed gravel Douglas Trail (see photograph). It was a great ride, doable five to six months per year, isolated, delightful, through the woods, and practical after long neuro days since I could ride home without lights in the dark. I had two problems: an occasional strolling skunk blocked the trail and kept her/his butt end aimed at me and forced a detour. The other was formidable thunderstorms; when the lightning flashes and thunder were close together, I'd abandon the bike and settle under a low bush. The trail sometimes accumulated six inches of water. Later, the trail was paved, extending the riding season. At Pine Island, our 100-year-old farm home was at the top of the hill on southwest County Road 13.

In 1986, I left Mayo for the University of California at Davis for collaborations with the veterinary school and veterinary residency. My research continued to examine MH and acetylcholine receptor responses.