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UNIVERSITY OF *Minnesota*



in this issue

- MALAWI MISSION: MEDICINE ON THE FRONTIER
- RADIOAUTOGRAPHIC STUDIES
- STUDIES OF HEARING

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C O N T E N T S

MEDICAL SCHOOL HISTORY – Part III 170

SPECIAL ARTICLE

Malawi Mission: Medicine on the Frontier
GAYLAN L. ROCKSWOLD 173

STAFF MEETING REPORTS

*Radioautographic Studies of Synthetic Patterns
for Tissues Labeled in Vitro*
BERTRAM F. WOOLFREY, M.D. 184

Objective Studies of the Auditory Process
JEROME A. HILGER, M.D. 186

1966 COMBINED APPEAL 188

MEDICAL SCHOOL NEWS 190

ALUMNI NOTES 193

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HISTORY OF THE MEDICAL SCHOOL

Part III



Names have made the news at the University of Minnesota Medical School since its opening in 1887. The institution's growth and development was shaped and formed under the influence of its many splendid teachers.

During the Medical School's 75th Anniversary Observance, the MEDICAL BULLETIN is publishing brief sketches of some of the great moments and the great men who helped write its history.

James E. Moore, M.D.

First chairman of the Department of Surgery at the University of Minnesota was Dr. James E. Moore, son of a Methodist minister. He was born and raised in Pennsylvania, attending public schools in that state before obtaining his medical degree from New York's Bellevue Medical College in 1873 at the age of 21.

Dr. Moore first arrived in Minneapolis in 1882. After two years of general practice, he left to study general and orthopedic surgery in Europe's major medical centers. When he returned in 1888 as the "first specialist west of New York," he also took up teaching duties at the old Minneapolis College Hospital. He stayed with academic medicine when the University of Minnesota Medical School was formed in 1888, becoming a full clinical professor of surgery at the University shortly thereafter. In 1908, at the age of 56, he became head of the Department of Surgery, a position he held until his death in 1918.

Dr. Moore took an active part in the reorganization of the Medical School in 1913, and was one of three original men around whom the new faculty was built. His was an influential voice in building the Surgery Department, the Medical School



James Edward Moore
1852-1918

itself, and the graduate school functions which resulted from the affiliation with the Mayo Clinic and Foundation. Intuitive, clear minded, forceful, with unusual skills in teaching clinical subjects, Dr. Moore was a favorite of the medical students. The *James E. Moore Society* honors his memory at the Medical School today with membership composed of faculty and students with special interest in surgery.

Dr. Moore served on many Minneapolis hospital staffs, and managed to maintain an active private practice during his years of clinical teaching at the University. He helped found the American College of Surgery, was president of the Minnesota Academy of Medicine, and of the Hennepin County Medical Society.

In 1910, while lecturing to a group of medical students, he was accidentally buried in debris from a fire that had damaged Millard Hall. He was badly injured. He narrowly escaped death, and never regained his former robust health. The increasing teaching load of World War I days also sapped his strength, and he died at age 66 in 1918, after a six-month bout with pernicious anemia.

The author of 200 scientific papers and a textbook on *Orthopedic Surgery*, published in 1898, Dr. Moore exerted a major influence on the Medical School. He insisted on upgrading the standards of surgical practice, which he felt was the duty of the surgeons themselves. He defined the intended goal of the Graduate School in Medicine: to train teachers as well as practitioners. This goal is essentially unchanged at Minnesota today.

Irvine McQuarrie, M.D.

When Irvine McQuarrie came to the University of Minnesota in 1930, he was regarded as one of the bright young men of the newly-developing specialty of pediatrics. He was to remain 26 years as professor and head of pediatrics at the Medical School, where his promise as an investigator, clinician, and educator was richly fulfilled.

Dr. McQuarrie might not have been born an American (Silver Reef, Utah, April 20, 1891) if the gold mine op-

erated by his parents in Scotland had been more productive. However, the McQuarries elected to emigrate to the American West, where Irvine studied mining engineering and married Vira Perkins, the daughter of another mining family. In 1915, however, Irvine turned his studies to biologic sciences, which were to be consummated at the University of California, Johns Hopkins, Henry Ford Hospital, Yale, and finally to Minnesota.

Through McQuarrie's entire medical career and life ran a humanitarian strain that was unusual even among pediatricians. His great love for children was easily recognizable in his gentleness with patients, and with his great humbleness and sincerity in the presence of children. His own marriage was blessed with three daughters.



Irvine McQuarrie
1891-1961

Among the two score or more prominent pediatricians this kindly man trained at Minnesota there is none who forgets the McQuarrie educational tradition: "Man is endowed with abilities to detect new things and is morally obligated to learn to understand life. To this end, he must recognize that Nature herself supplies the clues, but that the experiments of Nature must be studied so that man can advance."

Irvine McQuarrie retired with great esteem from the Minnesota faculty in 1956 after accumulating many of the highest honors in the field of pediatrics. He moved to Hawaii to continue his research at the Kaulaolani Children's Hospital in Honolulu, and later at Children's Hospital of the East Bay in Oakland, Calif.

On November 20, 1960, Dr. McQuarrie suffered a cerebral hemorrhage. He returned to Minneapolis, where he died in University Hospitals on Sept. 9, 1961.

His memory is permanently expressed at Minnesota in the form of the McQuarrie Pediatrics Fund, through which his friends and associates provide extra financial strength for the Department of Pediatrics. There is also an annual McQuarrie Lecture in pediatrics, as well as the poignant memory of a three-day pediatric grand reunion held in his honor in 1954 at the Medical School. Dr. McQuarrie's "pupils" came from far and wide to present their scientific reports and pay homage to their kind and generous preceptor. The real memory of Irvine McQuarrie of course, is in the hearts of men.

Special Article

Malawi Mission: Medicine on the Frontier*

Gaylan L. Rockswold†

On June 20, 1965, at 2:30 p.m. our plane touched down in Blantyre, Malawi, Central Africa. Suddenly the thinking and planning of the past two years began to be transformed into reality. During our 130-mile auto ride from Blantyre to the Malindi Mission my wife and I caught our first glimpse of the country which was to be our home for the next eleven weeks. There was a rugged beauty to the countryside with its mountains covered with stout trees and its long, brown grass waving in the breeze. The temperature was a comfortable 75 degrees as we had arrived during the cool dry season which lasts from May to October. It is very unusual for rain of any amount to fall during this time, and the various shades of brown of the vegetation reflected this fact. September and October become increasingly hot until the wet season begins in November lasting until April.

As we drove down the left side of the road with oncoming traffic on our right we were reminded that Malawi (formerly Nyasaland) had been a British protectorate since 1891 until gaining its complete independence on July 6, 1964. It is presently a member of the British Commonwealth with an official foreign policy of neutrality and nonalignment. The national government is primarily concerned with the development of the country.

Malawi is about 520 miles long and 50 to 100 miles wide with Zambia and Mozambique being its main bordering neighbors. It has a population estimated at four million making it one of the more densely populated countries of Africa. Only .25% of the population is of the Caucasian race. It is a relatively poor country with no valuable resources for large-scale indus-



Gaylan L. Rockswold

*From a report on a Foreign Fellowship sponsored by Smith Kline and French, and the Association of American Medical Colleges, June 20, 1965 to September 7, 1965

†Senior Medical Student, University of Minnesota

trialization. Cotton, ground nuts, tobacco, and tea are grown for export.

Most of the people live in small villages made up of houses built of sun-dried mud walls with dirt floors and thatched roofs. Each house has a courtyard surrounded by a reed fence in which there are small circular bins for storing maize, pens for goats and sheep, wooden fires and black pots, and chickens and children running about everywhere. The interior of the houses is dark and drab; a few low-lying platforms for sleeping and a chair or two constitute the furniture. The people are usually barefoot and wear tattered clothing. Most families make a living by subsistence farming, and maize and millet form the bulk of the foodstuff. The people living close to the lake add fish to their diet. The family often makes a little pocket-money by selling produce to or working for the Europeans. More and more of the husbands are venturing out to learn a vocation such as mechanics, truck driving, or teaching. These families tend to become "Westernized" in their way of life and are found in the larger population centers.

Nyanja and Yao are the main dialects spoken, but English is taught in all of the schools. The medical assistants speak English and interpreted for us, but not knowing the language of the people is a handicap. You not only require the services of a person needed elsewhere, but much is lost in the translation of a language. For instance, compared to English, Nyanja is rich in terms expressive of the nature of pain, but poor regarding concepts of gradation, progress, or regress.

The natives of Malawi are of the Negroid race and the Bantu tribe. The Bantu are a widely dispersed people of Eastern Africa. I would like to summarize an article by Dr. G. T. Nurse, "Concepts of Illness Among the Bantu." Dr. Nurse, a general practitioner who has worked in Malawi for fifteen years, wrote this article for the Peace Corps Volunteers and we found it very useful in our work. Of the four million people in Malawi an estimated three million follow their traditional teachings concerning religious and philosophical beliefs, while about 500,000 are Christian and an even smaller number are Islamic. These traditional beliefs recognize a single Deity of concentrated and transcendental power. This "power" extends to and is part of all entities, animate and inanimate, physical and spiritual. It is subject to increase and decrease, and the aim of the possessor is to preserve what he has and if possible to cause it to grow. Disease and misfortune are merely facets of this flux of power. A doctor practicing among these people should understand this because it explains why patients come to him: either village

THE MEDICAL BULLETIN

medicine has failed to bestow sufficient power to the patient (in which case the suffering is usually genuine), or else it is believed that any remedies prescribed will convey to the recipient some of the power of him who prescribes them (and then the sufferings are usually imaginary). In the latter case the patient is simply after "strengthening medicine" which will give him a general increase of power. The Bantu idea of disease is primarily an *affliction*; secondarily a local or general *discomfort*; only very remotely a *malfunction* of the body or one of its parts. Nothing of physiology is understood though blood and breath are recognized to be of vital importance. Disease-entities are not recognized; the part of the body in which the condition first manifested itself is all-important, and the complaint is called by that name. Pain is often described as referred far more widely and oddly than the anatomy of the part makes likely.

My foreign sponsor, the Anglican Diocese of Malawi, has attempted to bring to its people the material benefits of medical services in co-existence with its evangelical endeavors. In the medical department the primary interest is to provide the best possible care within the existing financial limitations, and to demonstrate the Christian concept of love of fellow man. Dr. Arthur W. Johnson, the Diocesan Medical Officer, is in charge of the medical department and has his headquarters at Likwenu. At the present time he is the only physician attending the diocesan hospitals which had 563,000 outpatient visits in 1964.

We were located at the Malindi Mission eleven miles from Fort Johnston on the southeastern shore of beautiful Lake



The Malindi Mission lies on the southwestern shore of beautiful Lake Malawi. There are numerous trees among the buildings and steep hills rise up behind the mission.

Malawi. The sound of its waves were our constant companion. It is one of the great lakes of Africa and of the world formed as part of the Great Rift Valley which is a prehistoric crack in the earth stretching across the entire body of Africa to the Red Sea, the Dead Sea, and the Jordan Valley in Asia Minor. Lake Malawi is 350 miles long and 20 to 50 miles wide, and its surface is 1,500 feet above sea level. The River Shire leaves the lake at its southern end (we crossed it by ferry on our trips to Fort Johnston) and runs 310 miles to join the Zambezi River in Mozambique.

The area about Lake Malawi has an interesting historical background. The lake itself was discovered or located by Dr. David Livingstone in 1859. There is an old tree on the Malindi Mission under which Dr. Livingstone is supposed to have rested on one of his journeys. The villages in the area were where many of the American slaves were recruited by the Arabs during the last century. Fort Johnston was built by the British in an attempt to halt this indescribable cruelty.

The Malindi Mission has been in existence for nearly a century. On its grounds there is a machine shop, a mill for grinding maize, a church, a grade school, a teacher training college, a hospital, and numerous homes. It is very picturesque; the buildings are all made of reddish sun-dried brick and have thatched roofs. There are many trees amongst the buildings and steep hills rise up behind the mission grounds.

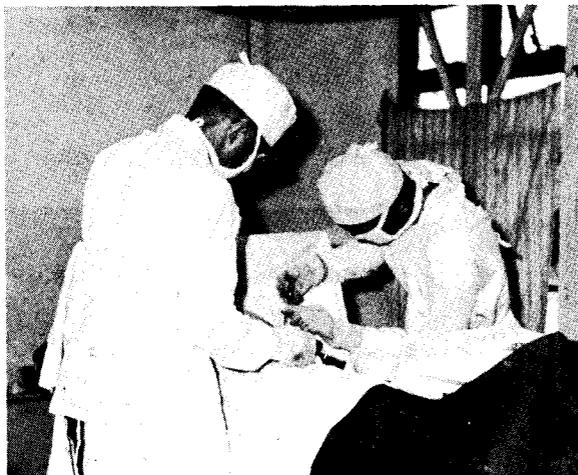
The Malindi Mission Hospital has been in existence since about 1900. It has 49 beds and an African staff of eight. The hospital is made up of eight separate buildings. One building houses the outpatient department, the operating theatre, and a small laboratory. Another houses the female ward and the delivery room. There is, in addition, a tuberculosis ward, pediatric ward, maternity ward, male ward, medical store house, and a dwelling where the relatives of each patient cook meals as food is not supplied by the hospital. Some of the buildings have electricity but none have running water. The open wards are plainly furnished with mosquito nets hanging down over simple steel-framed beds. The outpatient department features only the bare essentials of wooden benches, large porcelain wash basins, a wooden cabinet for the medicines, and a few trays for simple surgical instruments. During a clinic the room is packed with people who spill out onto the hospital grounds. There is an outpatient load of about 35,000 visits a year. Most patients prefer to be treated as outpatients even when they are very ill, and there are often premature discharges due to the lack of provisions supplied by relatives of the patient. Relatives

THE MEDICAL BULLETIN

often must be consulted before an admission or a procedure which sometimes results in the patient's not returning.

In addition to the Malindi Mission Hospital I was involved in the work of two mission dispensaries, a small leprosy village, and the government hospital in Fort Johnston. One of the dispensaries, Mpondas Hospital, is located on the Shire River three miles north of Fort Johnston. It has 26 beds and is run by an African staff of 12 who are supervised by an English nurse. The outpatient load is very heavy, averaging 90,000 visits a year. The other dispensary is at Mkope Hill which is on the western shore of Lake Malawi, 30 miles from Fort Johnston. There are 20 beds with an African staff of eight and an outpatient census of 70,000 a year. Biti Kalanje Leper Village is seven miles north of Malindi and is served by weekly visits from the Malindi Hospital staff. It is made up of 28 inpatients and their families. Treatment is also given to 54 outpatients. I spent much of my time at the government hospital in Fort Johnston. Dr. Loren Anderson, a graduate of the University of Minnesota Medical School in 1960, was in charge of the hospital and was my supervisor. The hospital has 130 beds and a staff of 30 people. Combining all of these medical units gives a total of 225 beds and 800 outpatients per day.

My surgical experience was gained with Dr. Anderson in the government hospital at Fort Johnston. During an eight-month period over 500 surgical procedures were carried out in



The author injects local anesthesia in preparation for a herniorrhaphy as Dr. Anderson gives instructions.

the operating theatre. Most were minor such as skin grafting or excising local lesions, but procedures such as herniorrhaphies and hysterectomies were done frequently. General anesthesia was administered in the form of open ether and chloroform by able medical assistants. However, because of inherent risks and lack of resuscitation equipment, local anesthesia was given priority. General surgical facilities were meager but adequate. An X-ray unit provided me an opportunity to learn to take and develop radiographs, but fluoroscopy studies had to be done at the government hospitals in Blantyre.

I gained a rudimentary knowledge of orthopedics by reading X-rays and reducing and casting several dozen fractures. Under Dr. Anderson's supervision I repaired three inguinal hernias and four hydroceles. Excising numerous local lesions and sewing up many lacerations improved my technique with scalpel and needle. Dr. Anderson was able to instruct me in anatomical relationships and surgical procedures as I assisted him. Surgery and its usual definite benefits to the patient were enjoyable. One particularly interesting surgical case we treated was a 35-year-old Negro man who was attacked by a lion. During the previous night he had gone out to check his livestock which had become frightened. The lion leaped at him, fracturing his left radius and inflicting bone-deep lacerations over his left thigh, buttock, and arm. It took several hours to repair his wounds.

In the field of internal medicine I gained my most extensive experience. A great deal of responsibility for seriously ill patients proved to be an excellent stimulus to learn. Our laboratory facilities were limited. Microscopic urine, stool, and peripheral blood examinations for parasites were carried out in large numbers thus enabling me to learn to diagnose the most common tropical diseases. Any hematological determination more complex than a hemoglobin, or a bacteriological investigation more involved than a stained smear had to be sent to the government laboratory in Blantyre. Our drug supply was of sufficient variety and quantity. I learned much about drug dosages and treatment schedules. Pathogenic microorganisms in Malawi seemed to be sensitive to smaller concentrations of a particular antibiotic than was the case in the U.S.A. For example, 900,000 units of procaine penicillin intramuscularly daily was considered an adequate dose for an adult with a staphylococcal abscess. This was probably due to the relatively infrequent use of antibiotics which prevented the development of resistant microorganisms. The African patient seemed to be more resistant to disease; sterile technique was often not satisfactory, yet very few infections resulted. This may be due to

better immunity resulting from constant exposure over many generations. The bulk of the patients have hookworm, bilharzia (*Schistosoma haematobium*), and/or malaria. Conjunctivitis is seen in large numbers (400 cases a year at Malindi). Corneal scarring and blindness often resulted from the use of local remedies in treating this comparatively simple disease.

Tropical ulcers are common (over 900 per year at Malindi). The etiology of this affliction remains an enigma. We had one elderly lady whose tropical ulcer was supposedly older than myself. Split-thickness skin grafts often failed to "take," especially if the ulcer was chronic.



These lepers are waiting for drugs at the Biti Kalanje dispensary. The manifestations of this disease range from mild skin lesions to loss of hands and feet.

Prior to going to Africa the word leprosy brought to our minds a vague image of a dreaded Biblical disease. Leprosy, in fact, is very noninfectious since a susceptible person must have prolonged exposure before contracting it. Its manifestations ranged from mild skin lesions to loss of hands and feet. Many patients had partial loss of vision secondary to keratitis and iridocyclitis. The wonderful sense of humor of the lepers is somewhat amazing when one considers their situation in life.

I examined and treated four cases of meningitis. One gratifying meningoencephalitis case was a 28-year-old mother of five whose husband was a theological student. At one point in her illness she was unresponsive to any pain stimuli and had a temperature of 105.4 degrees. In two months she was home with very mild residual effects.

Over 500 cases of syphilis are treated each year at the hospitals. Gonorrhoea patients are treated as if they had syphilis because there are no laboratory facilities for serologic tests. In our medical school lobar pneumonia is something of a novelty. In Malawi, I examined perhaps 50 to 60 cases of classical lobar pneumonia. Convulsive disorders and severe burns were a frequent combination as the former caused falls into the open fires. I also examined cases of typhoid, diphtheria, tetanus, cerebral vascular accidents, hypertension, hepatitis, Pott's disease, various tumors and skin diseases to name a few.

One interesting case was a 40-year-old man who three days prior to admission found he could not open his mouth. Later in the day he had great difficulty in walking because of stiff legs. On the day of admission he had a sore, stiff back and muscle spasms of the face, neck, and arms. Trivial stimuli such as bright lights or any movement would elicit these spasms. No history of a wound or any other possible source of infection could be obtained. On physical examination one immediately noticed the patient's fixed smile and raised eyebrows (risus sardonius). There was complete trismus and frequent spasms of the facial and neck muscles. An occasional generalized convulsion occurred. There was marked opisthotonus and rigid but nontender abdominal muscles. The patient was given 100,000 units of tetanus antitoxin intravenously plus sedatives and muscle relaxants. Gradually the patient improved. No laboratory work was done but the presumptive diagnosis was, of course, tetanus.

My experience in pediatrics was also good. Four cases of neonatal tetanus which result from the unclean management of the umbilical cord developed during the summer. In many villages mothers "clean" the cord with ashes from the fires. Malnutrition was most commonly seen in small children weaned from the breast because of the birth of another child. And there were dozens of cases of pertussis, measles, colic, otitis media, pneumonia, and upper respiratory infections.

Most patients, children and adults, had a combination of several diseases. There was an eight-year-old boy named Amizi who we nicknamed the "five-star general." He had malaria, hookworm, bilharzia, tuberculosis, glaucoma, and in addition was markedly malnourished. Unfortunately, this was the general rule rather than the exception.

Some of the problems of conducting a research project and organizing a followup study involving human subjects became evident when Dr. Anderson and I carried out a skin grafting experiment. We wanted to test the notion commonly accepted

by the medical assistants that Africans accept skin grafts from unrelated Africans. Our results seemed to disprove this idea.

Some work was done in the area of public health. My wife, one medical assistant, and I vaccinated the 285 primary school children at Malindi for smallpox and diphtheria, pertussis, and tetanus. The medical staff did urine and stool exams on the school children. We found 57% had hookworm and 16% had bilharzia. Treatment was instituted for those infected. Dr. Anderson did a study at Samama village which is extremely poor and located in a swampy



Mrs. Rockswold, a registered nurse, accompanied her husband to Malawi. She and a medical assistant are vaccinating a school girl.

area. Out of 290 stool exams 75% were positive for hookworm, and out of 237 urine exams 72% were positive for bilharzia. The average hemoglobin for 294 villagers of all ages was 62.4%. These statistics speak for themselves and there is no need to go into the extremely poor facilities for waste disposal. Suffice it to say, great improvement is needed.

At the Biti Kalanje Leper Village we did urine and stool exams on the inpatients and found 24% infected with hookworm and none had bilharzia. These relatively low percentages are probably due to the closer medical attention these people receive. Bedbugs created much discomfort until eradicated by the use of gammaxine on all the beds and mattresses.

The teacher training college has a staff of five (three are Peace Corps Volunteers) and a study body of 90. It provides a two-year course covering the subject matter and teaching methods needed to teach in the country's primary schools. The secondary school certificate (roughly equivalent to our high school diploma) is not required for admission. Therefore, the students are of widely ranging ability. I had some difficulty in deciding what to teach in my allotted ten one-hour class periods. About then a second year student came to me complaining of impotence. On questioning him as to the cause of his difficulty he stated that since sperm were stored in the spine something was the matter with his back. My decision had been made. The students were receptive and interested and asked many

pertinent questions. Two examples were, "Why doesn't semen and urine get mixed up in the male urethra?", and "Why doesn't a woman ovulate during pregnancy?" We also discussed the three common diseases in the area: hookworm, bilharzia, and malaria, stressing their prevention. I was not quite so enthusiastic over their final examination results, but it was a unique experience portraying the African's way of thinking. An illustration of this was the discussion which centered around a student's question, "If a husband has sexual intercourse with another woman and returns to his pregnant wife will he cause her to abort?"

The other phase of my educational experience involved a dialogue with the African medical assistants during the course of our working day. Such things as the pathophysiology of various diseases, the use and abuse of drugs, physical diagnosis, and proper procedure in patient care were discussed. The medical assistants in the various hospitals extract over 350 teeth a year. Their attempts at anesthesia were haphazard. Acting on Dr. Anderson's request I spent several afternoons at the University of Minnesota Dental School learning to give anesthesia for extracting various teeth. I did my best to pass this knowledge on to the medical assistants which should result in considerably less pain to the patients. I learned a great deal from them about tropical diseases and the practical techniques of working in a "bush" hospital.



The influence of ancient tribal beliefs is depicted as the village "medicine man" offers his wares for sale. Empty whiskey bottles make convenient containers for the "mankhala."

THE MEDICAL BULLETIN

A few observations on the over-all medical situation in Malawi are perhaps indicated. With a population of four million the country has never had over 70 to 80 practicing doctors, making the proportion of doctor to population one to 60,000. At the present time the budget of the Health Department is large enough to allow only concentration on curative services to the exclusion of preventive health measures. If looked at in a broad perspective the efforts of a single doctor dispensing medicine to individuals seems to be quite futile. For example, a person can be cured of hookworm only to be infected again several months later. Only when the resources of churches, government, and foreign supporters are pooled to initiate educational and public health programs will medical conditions improve.

The experiences we have had in Malawi are impressed forever on our consciousness. We will never forget our friends there and the efforts they made to make us feel at home. Especially to Dr. Johnson and his family who were so generous and kind and to Dr. Anderson for the extra time and effort he gave, we are indebted. Africa is a sprawling giant of infinite variety, but this fact unites it: its people are struggling for identity and recognition and a better life in a world harassed by conflicting political pressures. There is no question in our minds as to the outcome, and it is our hope to someday return to this struggle. We extend our most sincere and heartfelt thanks to the Smith Kline & French Company and to the Association of American Medical Colleges for making this most meaningful experience possible.



Staff Meeting Report

Radioautographic Studies of Synthetic Patterns for Tissues Labeled in Vitro*

Bertram F. Woolfrey, M.D.†

The object of this report is to present observations relating to certain *in vitro* synthetic patterns of tissue slices. For this study we have utilized variations of the following system as an experimental model. Normal mouse tissues or transplanted solid mouse tumor tissues were excised from etherized animals and were cut into small blocks approximately 5 x 4 x 3 mm. in size while in cold isotonic salt solution. These pieces of tissue were then incubated under varying conditions and for varying time periods in Hanks Balanced Salt Solution (HBSS) to which tritium labeled metabolic precursors could be added. Radioautographic preparations were made using the emulsion dipping technique and by means of these the location and extent of labeling in the cells of the tissue fragments were evaluated. Some of the experimental variations and results are outlined as follows:

Pattern of labeling: Small blocks of transplantable mouse Sarcoma 180 or Cloudman melanoma were incubated at 37° C. in HBSS containing tritiated thymidine. Radioautographs showed labeled material only in a zone of 8-10 cells in thickness about the periphery of the tissue block. Presoaking the tissue blocks at 4° C. in HBSS containing tritiated thymidine for several hours to insure diffusion of the thymidine into the central portion of the tissue did not alter the pattern of peripheral labeling. This suggested that peripheralization of the label was not a function of diffusion failure or filtration of the labeled material but that other factors, to be pointed out later, were at work.

Incubation time: The degree of nuclear label was studied with respect to length of incubation in labeled material. Using two week radioautographic exposure times, it was found that for 10 minute incubation periods only a slight label occurred, for 20 minutes a significant but weak label occurred, and for one

*From a report to the Staff Meeting of University Hospitals on January 7, 1965 and supported by AEC Grant 11(1-1089)

†Instructor, Department of Pathology, University of Minnesota

hour to two hour periods optimum labeling occurred. Beyond this time, label tended to be lost and cells tended to undergo autolysis.

Hypothermic storage: The effect of hypothermic storage time at 4° C. prior to incubation in tritiated thymidine was studied. It was found that uptake of tritiated thymidine for storage times up to 18 hours was similar to that for control material incubated at the time of tissue excision. For storage periods longer than 18 hours there was gradual and variable loss of ability to label with no label observed after 72 hours. From this it was concluded that a fairly safe range of hypothermic storage times could be used for future studies but that a standard hypothermic storage time should be selected for certain studies which will be described later.

Temperature: Optimum and comparable labeling was observed in a temperature range of 32-42° C. Definitely less labeling was produced at room temperature incubation (25-27° C.). No uptake was observed at 4 C°. storage temperatures.

pH of incubation media: Uptake of tritiated thymidine occurred over a rather wide pH range. None was observed below pH 4.0. Optimum uptake was found for pH 7-9, and none was found beyond pH 11. The asymmetrical pH distribution and wide range is interesting and is as yet unexplainable.

Oxygen concentration and hyperbaric effects: As indicated previously, only cells of the peripheral portions of the tissue block were found to label under standard conditions. Attempts were therefore made to clarify the reasons for such a pattern of labeling. It was found that incubation in an atmosphere of 95% O₂-5% CO₂ produced a somewhat thicker zone of labeled cells than that found for incubation with air alone. Incubation with three atmospheres pressure of 100% oxygen or air greatly increased the thickness of the labeled zone with hyperbaric oxygen being much superior to hyperbaric air.

Utilizing information and techniques as outlined above, studies of a more "practical" nature have been and are continuing to be made in our laboratory. One such study (Radioautographic evaluation of freeze-thaw buffers using nucleic acid and Glycine- related synthetic systems *in vitro*, Woolfrey, B. F., Lab. Invest., 13:581-586, 1964) has demonstrated the ability of various "freeze-thaw" buffers to preserve synthetic systems from damage by freezing.

Staff Meeting Report

Objective Studies of the Auditory Process*

Jerome A. Hilger, M.D.†

Sound stimulation results in the release of measurable electrical activity from the cochlea, the eighth nerve, and the auditory cortex. The measurement of cochlear and cortical responses recorded from skin electrodes and averaged with an on-line computer technique can provide an objective method for the determination of hearing thresholds and the further analysis of sensori-neural hearing deficits.

Evoked response in terms of electrical phenomena is presently determinable at three levels in the laboratory animal: the cochlear microphonic, the action potential of the eighth nerve, and the potentials at the auditory cortex.

The cochlear microphonic is an electrical response of near zero latency which has no refractory period and which in the cat can follow input frequencies up to 16,000 per second. It appears to be generated in the outer hair cells of the organ of Corti. When amplified and fed into a loud speaker, the microphonic response can reproduce words spoken directly into the experimental animal's ear. This phenomenon is known as the Wever-Bray effect. The cochlear microphonic has usually been recorded from the round window. This necessitates surgical placement of an electrode in the middle ear. We have evolved a method of measuring the microphonic signal with skin electrodes. We are presently adapting this technique to the measurement of the microphonic in humans, so that it can become an objective clinical tool.

The action potential of the eighth nerve is the same type of trigger-like release of energy from the depolarization and repolarization as characterizes any nerve unit. It follows the "all-or-none" law. In the animal it is recorded from electrodes placed on the eighth nerve by way of craniotomy exposure. At present the necessity of such exposure precludes the recording of the action potential in humans.

*From a report to the Staff Meeting of University Hospitals on January 21, 1966

†Clinical Professor, Department of Otolaryngology

The action potential is said to have a latency from sound wave to nerve impulse of 0.6 millisecond. This delay is felt by some to be due to chemical intermediation in the transfer of mechanical sound pressure to nerve response. Work in our laboratory on the cat as the experimental animal does not confirm this generally accepted 0.6 millisecond delay, but suggests that there is neural electrical activity of very short latency that occurs as an action potential in the eighth nerve, which has been lost in conventional methods of recording. This short latency response discounts slow transfer of neural activity to the peripheral segment of the auditory nerve and suggests a more rapid transition between hair cell and nerve.

Inhibition in the cochlea is effected through the efferent bundle of Rasmussen, a small group of myelinated fibers functioning efferently through nerve endings clustered around each peripheral hair cell. The mechanism of inhibition is unknown. The efferent action is produced by the firing of afferent cochlear fibers and measurable efferent potentials result on the same side and, through cross-over innervation, on the opposite side. This latter action has been well defined and confirmed elsewhere. In our laboratory, using a method comparable to the original Wever-Bray method, we have demonstrated in the cat a remarkable fidelity of the efferent cross-over message to the cochlear input message. When the efferent cross-over response is passed through adequate amplifiers and filters to a speaker, the input message is readily understood.

Central transference of the action signal from the eighth nerve through secondary and higher neurons follows bilateral pathways to the auditory cortices. Sound initiated electrical activity displayed at the cortex can be measured as evoked EEG response.

Correlation of long latency electrical activity recorded at the vertex in the human with threshold input signals to the ear have been reported by several investigators including Cody and Bickford at the Mayo Clinic. The latter's experience indicates that threshold cortical response at several significant frequencies correspond well with known thresholds. The procedure has been termed "cortical audiometry." We presently use this method in the laboratory in the evaluation of selected patients with suspected congenital deafness, psychogenic hearing impairment, or simulated deafness (malingering).

It appears inevitable that today's laboratory hardware and computer methods will provide some of tomorrow's routine clinical measurements of hearing.

Annual Medical Alumni Fund Appeal Underway

"Your Medical Diploma" is the theme of the 6th annual Combined Appeal to Medical Alumni which is currently underway. Alumni are reminded of the privileges and obligations which accrue to holders of medical degrees from the University of Minnesota, and of the needs of their Alma Mater.

Each of the Medical School's 5,100 living graduates was sent the Combined Appeal circular in December. Alumni are asked to contribute to the medical funds of their choice. The 1965-66 Combined Appeal continues through March 31st.

If you have not already done so, please send your tax-deductible contribution today, in the special maroon envelope provided. Earmark the fund you wish to support:

MINNESOTA MEDICAL FOUNDATION FUNDS

1. *Undesignated Fund*
2. *Scholarship Endowment Fund*
3. *Cyrus P. Barnum, Jr., Memorial Teaching Fellowship*
4. *Dr. Donald J. Cowling Memorial Fund*
5. *Dermatologic Society Research Fund*
6. *Diehl Hall Biomedical Library Fund*
7. *George E. Fahr Endowment Fund*
8. *Paul S. Hagen Memorial Lectureship*
9. *Medical Research Fund*
10. *Frederick and Vivian Hoffbauer Memorial Fund*
11. *Ralph T. Knight Anesthesiology Research Fund*
12. *Medical Alumni Student Adytum Fund*
13. *Medical Student Emergency Loan Fund*
14. *Mediclinics - Florence Kerkhof Loan Fund*
15. *Mary Ahlquist Robertson Memorial Fund*
16. *C. J. Watson Research Award Fund*

OTHER MEDICAL FUNDS

17. *Artificial Kidney Fund*
18. *E. T. Bell Pathology Museum Fund*
19. *Luthard N. Bergh Memorial Fund*
20. *Marlow Bergstrom Arthritis Research Fund*
21. *Frank E. Burch Ophthalmology Research Fund*

THE MEDICAL BULLETIN

22. *A. J. Chesley Lectureship*
23. *Children's Rehabilitation Center*
24. *Wallace Cole Orthopedic Research Fund*
25. *Diabetes Research Fund*
26. *Eye Pathology Fund*
27. *Robert A. Good Pediatrics Research Fund*
28. *Internal Medicine Research Fund*
29. *J. C. Litzenberg Memorial Room Fund*
30. *Malignant Disease Research Fund*
31. *McQuarrie Pediatrics Fund*
32. *J. Arthur Myers Tuberculosis Research Fund*
33. *Neurology Research Fund*
34. *William A. O'Brien Scholarship Fund*
35. *Physical Medicine Research Fund*
36. *Radiation Therapy Research Fund*
37. *Richard L. Varco Surgical Research Fund*
38. *O. H. Wängensteen Surgical Research Fund*

Gifts for any medical purpose at the University of Minnesota may be contributed through the Minnesota Medical Foundation. Your check should be made payable to the Minnesota Medical Foundation, and sent c/o 1342 Mayo Building, University of Minnesota, Minneapolis, Minn. 5455.



Medical School News

Dr. Cecil J. Watson, Distinguished Service Professor and Head of the Department of Internal Medicine, is relinquishing his post at the Medical School on July 1, 1966. He has been chief of medicine at Minnesota since 1943, and one of the nation's leading medical educators for nearly three decades.

Dr. Watson has announced that he will move to Northwestern Hospital in Minneapolis to become head of a newly created teaching unit which will concentrate on postgraduate education of interns and residents. He will remain a full professor in the Medical School, but his post and that of two associates will be supported by Northwestern's Medical Education Endowment Fund.

Dr. Watson will also transfer his research activities to Northwestern, to carry on studies of liver disease, bile pigments, and porphyrins, which have been his special fields of research interest for many years.



C. J. Watson

Dr. Watson had previously announced his decision to give up the department headship at Minnesota in 1966. He is completing a 31-year career on the University faculty in 1966. He became a professor of medicine in 1940, and received the Minnesota Medical Foundation's Distinguished Service Award in 1961.

The search is underway for his successor.

PSYCHIATRY AND NEUROLOGY

Dr. Hugh A. Storrow has joined the Department as a professor of Psychiatry. He replaces Dr. Ian Gregory, who became chairman of Psychiatry at Ohio State University. Dr. Storrow was an associate professor of psychiatry at the University of Kentucky, and taught previously at Yale and UCLA. He is a graduate of U.S.C.

PEDIATRICS

Dr. Richard B. Raile, chief of pediatrics at Hennepin County General Hospital, has been appointed medical director of the institution succeeding Dr. Thomas Lowry.

SURGERY

The recent appointment of Dr. Joseph Bradley Aust as professor and chairman of the Department of Surgery at the soon-to-open University of Texas South Texas Medical School in San Antonio adds another name to the list of University of Minnesota-trained surgeons who are now heads of departments among the nation's 90 medical schools. Twelve men who trained at Minnesota under Dr. O. H. Wangensteen have now assumed such positions.

In addition to Dr. Aust are:

Dr. John R. Paine, University of Buffalo

Dr. Clarence Dennis, State University of New York,
Brooklyn

Dr. K. Alvin Merendino, University of Washington
School of Medicine

Dr. David State, Albert Einstein Medical College

Dr. Francisco L. Raffucci-A., University of Puerto Rico

Dr. Bernard Zimmermann, West Virginia University

Dr. Gilbert Campbell, University of Arkansas

Dr. Fletcher A. Miller, Creighton University

Dr. Alan P. Thal, Wayne State University

Dr. Richard H. Egdahl, Boston University

Dr. Richard DeWall, Chicago Medical School

Fourteen other Minnesota-trained surgeons hold appointments as professors and/or directors of surgical divisions in U.S. medical schools.

DERMATOLOGY

The December meetings of the American Academy of Dermatology in Chicago, Ill., were highlighted by the winning of both *Awards of Merit* by University of Minnesota research teams. The Gold Award for a scientific exhibit representing original work was won by Dr. A. S. Zelikson and Dr. R. L. Coupe for "Effect of Hydrocortisone on Fibroblasts and Collagen Synthesis." The Gold Award for exhibits of high teaching value was won for work on "Erythropoietic Protoporphyrin" by Drs. R. M. Fusaro, Edward S. Peterka, Manuel O. Jaffe, Walter J. Runge, Robert W. Goltz, and Cecil J. Watson, representing the Division of Dermatology and the Department of Medicine. Never before in the history of the 3,000-member Academy has one institution captured both major honors in the same year.

INTERNAL MEDICINE

Dr. Dennis Kane has announced his resignation as director of medical education at St. Paul-Ramsey Hospital, effective January 31, 1966.

Dr. James F. Hammarsten, who has been professor and head of medicine at St. Paul-Ramsey, has been appointed professor and vice-chairman of the Department of Medicine at the University of Oklahoma Medical Center, effective April 1, 1966.



This 10-sided Meditation Room has been built in a courtyard of the University Hospitals to serve the spiritual needs of patients, relatives, visitors, and staff. It is reached by an enclosed walkway from the main lobby, and also houses offices for hospital chaplains. The unusual building stands on half-story stilts near the 3rd floor hospital's sun-deck. It was provided by a gift of \$187,000 from an anonymous friend of University Hospitals. Stained glass windows highlight its decor, and the design features multi-curved reinforced concrete forms which were cast in a local boatworks. No formal religious services are conducted in it, and the chapel is non-denominational.

Alumni Notes

Dr. Robert Hugh Monahan (Med. '42), St. Paul ophthalmologist and clinical associate professor at the Medical School, was elected president of the Minnesota Medical Alumni Association on January 11, 1965.



R. H. Monahan

He succeeds Dr. James Mankey (Med. '43) as head of the 2,409 member Association. The term of offices is one year.

Elected 1st vice-president was Linneus Idstrom (Med. '38), a Minneapolis radiologist. Kenneth P. Manick (Med. '60), was chosen 2nd vice-president; Leonard Arling (Med. '35), was named secretary; and George Janda (Med. '47), was elected treasurer. All are from Minneapolis.

The Association will hold its annual Alumni Luncheon for members of the Senior Medical Class at the Medical School on May 6th, and has scheduled its 1966 Medical Alumni Homecoming Reunion for the weekend of October 14-15 in Minneapolis. Alumni who received their M.B. degrees in 1941 will be honored on the 25th anniversary of their graduation from the Medical School.

The Association membership presently comprises 41.1% of the 5,752 medical degree holders listed on M.M.A.A. records, ranking the medical alumni group in fourth place for participation among 16 constituent units of the University of Minnesota Alumni Association.

The Board of Directors was informed that gifts of \$90,164.78 had been received for Medical Alumni Student Adytum project, with only \$2,409.00 in pledges left outstanding.

◆ 1912

Warner G. Workman, physician and surgeon in Tracy, Minn. for 52 years, retired in July. For more than 50 years he was a district surgeon for C & NW railroad.

◆ 1920

Hugh T. Jones writes that he is retired from practice and living in Santa Ana, Calif. His address is 1051 Hyde Park Dr.

◆ 1924

Ernest A. Olson, general practitioner in Pine Island, Minn., received a plaque from the community in appreciation of his 41 years of service.

◆ 1927

Warren M. Dodge, Jr., who practiced ophthalmology for 32 years in Battle Creek, Mich., recently retired from practice.

◆ 1930

Col. Ralph R. Sullivan, commander of the 45th Station Hospital, U.S. Army Reserve, was awarded the Army Commendation Medal for meritorious performance. In civilian life is Director of Occupational Health for the Oregon State Board of Health. Dr. Sullivan was once associated with the Minnesota Department of Health. During World War II he served in the Pacific and was awarded the Bronze Star medal.

◆ 1933

Robert R. Kierland, head of the Section of Dermatology in the Mayo Clinic and professor in the Mayo Graduate School of Medicine, was elected first president of the new Dermatology Foundation in December, 1965. The foundation was established in 1963 to obtain support for education and research in the specialty of dermatology. It has headquarters in New York City.



Robert R. Kierland



John P. Stapp



Leo J. Gehrig

◆ 1937

Robert W. Merrill had discontinued practice in Morris, Minn., and is now a fellow in physical medicine and recreation at the Medical School.

◆ 1943

Walter B. Shelley has been named chairman of the Department of Dermatology at the University of Pennsylvania School of Medicine. He joined the faculty there in 1946, has since taught briefly at Dartmouth, and is co-author of *Dermatology*, a standard textbook.

Col. **John P. Stapp**, USAF, MC, won the 1965-66 *Medical Tribune Auto Safety Award* for "lifesaving achievement in the the service of health" through advancement of efforts to reduce death and injury on the nation's highways. A career air force medical officer, he is now chief of the Impact Injury Branch, Armed Forces Institute of Pathology, Washington, D.C.

◆ 1945

Leo J. Gehrig has been appointed Deputy Surgeon General of U.S.P.H.S. He has been Chief of the U.S.P.H.S. Bureau of Medical Services since 1964. Prior to that assignment, he was the first Medical Director of the Peace Corps.

◆ 1946

Francis J. Haddy will head the Department of Physiology, effective June 1, 1966, at the new medical school of Michigan State University. He is presently professor and chairman of physiology and associate professor of medicine at the University of Oklahoma Medical Center.

◆ 1947

Antoni M. Diehl, associate professor of pediatrics at the Kansas University Medical Center, was installed president of the Kaw Valley (Kansas) Heart Association in June.

◆ 1948

Robert T. Jensen, a Lutheran medical missionary with a "big idea and mighty determination," according to the *Minneapolis Tribune*, is in Moshi, Tanzania, where he is creating a 420-bed hospital near famous Mt. Kilimanjaro "to improve the life of the Tanzanian people." With support from West Germany, Sweden, and the U.S., the hospital will open in 1968 with a staff of 15 and will eventually include training for nurses, residents, and tropical medicine. It will also offer facilities for radiology training, optometry, a landing strip for "bush-serving" doctors, a public health school, an institute of tropical medicine, a basic science medical college, and a school for children of personnel. A former Army officer, Bob comments, "Everybody around here may hate me by the time this Kilimanjaro Christian Medical Center starts, but it *will* start!"

◆ 1949

Norman W. Hoover, consultant in orthopedic surgery at the Mayo Clinic, was recently in Viet Nam spending two months as a volunteer participant in *Project Viet Nam*, performing surgery in South Viet Nam hospitals. He was a *Project Hope* volunteer in 1961 in Viet Nam and Indonesia, in 1962 in Viet Nam, and in 1964 in Ecuador.

◆ 1951

Herb L. Huffington, Waterville, Minn., is new president of the Minnesota Academy of General Practice. **E. P. Donatelle** (Med. '50), Minneapolis, is vice president, and **Chester A. Anderson** (Med. '44), Hector, is secretary-treasurer.

◆ 1953

Arnold M. Berg is now associated with the Falls-Starekow Clinic in Thief River Falls, Minn.

◆ 1954

James A. Donaldson has been appointed professor and chairman of the new Department of Otolaryngology at the University of Washington School of Medicine, Seattle. He was formerly on the staff of the University of Iowa, and received his M.S. from the University of Minnesota in 1961.

◆ 1955

Dale A. Bergeron is taking his residency in internal medicine in San Francisco, Calif. with the U.S.P.H.S. His address is 25 Diamond Head Passage, Corte Medera.

◆ 1956

John A. Gronvall, associate professor of pathology at the University of Mississippi, was appointed acting dean of the School of Medicine. He will serve pending selection of a new dean to replace Dr. Robert Q. Marston, who has resigned.

◆ 1956

Lloyd T. Wood has been appointed an assistant to the staff P M & R at the Mayo Clinic. He began a fellowship there in July, 1964.

◆ 1958

Paul W. Gerster has been assigned chief of OB-GYN at the U.S. Army Hospital at Fort Hood, Tex.

Thomas J. Lehar and **Gene G. Hunder**, fellows at the Mayo Graduate School of Medicine, received their M.S. degrees in the field of internal medicine from the University of Minnesota on December 18, 1965.

Robert A. Olson completed an OB-GYN residency at the Grady Memorial Hospital in Atlanta, Ga., and is presently an instructor at the Chicago Lying-In Hospital.

◆ 1959

Bradley E. Appelbaum is with the Kansas University Medical Center as assistant clinical professor of pediatrics. He also serves as Kansas City regional medical consultant on mental retardation for the U.S. Children's Bureau.

◆ 1959

James J. Plorde and **Mrs. Plorde** are serving with the Peace Corps in Africa. Their two daughters, Michelle and Lisa, are with them while Jim serves at the Public Health College in Gundar, Ethiopia. Mail will reach them c/o 332 Budd St., Fairmont, Minn.

◆ 1960

Richard T. Henry is medical officer with Trans World Airlines at the John F. Kennedy Space Center, Merritt Island, Fla.

◆ 1961

Nancy Jo Engeset has accepted a position with the Department of Anesthesiology at Massachusetts General Hospital. For the past year she studied at the *Anesthetie Abetilun Bürgerspital* in Basel, Switzerland and comments that she "enjoyed the experience in medicine and anesthesia, learning German, seeing other European medical centers and cities, and learning the Swiss way of life." Nancy was married December 27, 1965 in Minneapolis to Dr. Robin A. van der Molen of Johannesburg, South Africa.

Terence J. Scallen has been appointed assistant professor of biochemistry at the new 2-year University of New Mexico School of Medicine which opened its doors in 1965.



James Donaldson



Thomas J. Lehar



Gene G. Hunder

◆ 1962

Robert L. Hegrenes has joined the staff of the River's Edge Medical Clinic in Farmington, Minn.

Paul E. Mertens recently completed two years of medical service in a mission hospital in Zorzor, Liberia, and is now a resident in pediatrics at the University of Missouri. His address is 47 East Drive, Columbia, Mo.

◆ 1963

Capt. Creighton A. Holstad is serving with the U.S. Army Medical Corps. He is assigned to the Ethiopia U.S. Mapping Mission, c/o A.P.O. New York, N.Y. 09319.

Lloyd L. Leider, Jr., writes from Hawaii where he is stationed with the Marine Corps that "we have a nice big house here and are spreading the world far and wide to spend a vacation at Leider's motel." They recently welcomed Lloyd Laurence III to the family circle. His address is: Lloyd L. Leider, Jr., Lt. (MC) U.S.N.; Medical Department, BLT 1-5; First Marine Brigade FMF; c/o FPO, San Francisco, Calif.

Robert Mathison is now in practice with Lester H. Bendix (Med. '28) in Annandale, Minn.

◆ 1964

Walter L. Bailey writes from Ft. Defiance, Ariz., where he is assigned in practice to the Indian Service Hospital of the U.S.P.H.S. He is one of 11 doctors assigned to a 100-bed hospital and outpatient clinics serving 2,500 patients a month. Walt calls it a "wonderful general practice residency." He and his wife, Ginger, announce the arrival of Douglas, now three months old. Their daughter Sarah is now two years old. Their address is Box 476, Ft. Defiance, Ariz.

Roy E. Daumann has joined the staff of the Jackson, Minn. Medical Center.

C. Roger Herbrandson is practicing on the staff of the Homestake Hospital in Lead, S.D.

Daniel A. Johnson has joined the medical staff of the Litchfield, Minn. Clinic.

Capt. Hanan J. Rosenstein writes from Kadena Air Force Base, Okinawa where he is practicing. His address is: 824th USAF Dispensary, APO San Francisco, Calif. 96239.

Alumni Deaths

◆ 1920

Dr. George C. Doyle, St. Cloud, Minn. Died October 4, 1965, aged 69, of bronchogenic carcinoma. He was a veteran of World War II, and was associated with the U. S. Veterans Administration in medical practice.

Dr. Roger L. J. Kennedy, Rochester, Minn. Died January 14, 1966, age 68, of the effects of a series of cerebrovascular accidents and emphysema. He was widely known as a specialist in diseases of children, and was head of the Section of Pediatrics of the Mayo Clinic from 1946 to 1957. He had retired, for health reasons, from the Clinic on April 1, 1961. Dr. Kennedy had a wide range of professional and civic activities both national and local. Among his survivors is a son, Michael, who is a student at the Medical School.

◆ 1921

Dr. Harry C. Jensen, Edina, Minn. Died January 2, 1966 in Miami, Fla. He was 70 years old and owner of the Edina Medical Center, as well as a staff member at Deaconess Hospital, Minneapolis.

◆ 1925

Dr. Edwin C. Muir, Tacoma, Wash. Died October 17, 1965, at age 63, of cerebral thrombosis. He was on the staff of several hospitals in the Tacoma area.

MEMORIALS

The Minnesota Medical Foundation acknowledges with gratitude recent contributions made in memory of:

Sally Rosen
Minneapolis, Minn.

Mrs. Susan Rinke
St. Paul, Minn.

Mrs. Grace Marshall
Crosby, Minn.

Milton Mutch
Minneapolis, Minn.

Memorial gifts are a thoughtful means of honoring the memory of a relative, friend, or colleague. They serve the living by strengthening medical education and research at the University of Minnesota Medical School. Gifts may be designated for specific purposes. The Minnesota Medical Foundation acknowledge all gifts to both donor and next of kin.

COMING EVENTS

University of Minnesota Medical School

CONTINUATION COURSES FOR PHYSICIANS

University of Minnesota
Center for Continuation Study

1966

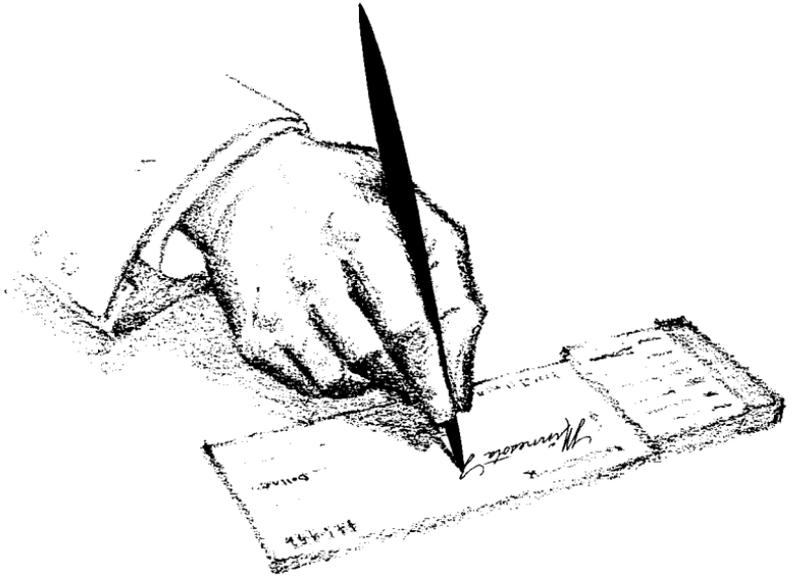
January 3 - 7	Electrocardiography (Intermediate)
January 17 - 18	Psychiatry
February 14 - 18	Proctology
February 21 - 23	Neurology
April 1 - 2	Trauma
April 22 - 23	Neurosurgery
May 2 - 4	Ophthalmology
May 19 - 21	Surgery
June 1 - 3	Anesthesiology

The University of Minnesota reserves the right to change this schedule without notification.

Courses are held at the Center for Continuation Study or the Mayo Memorial Auditorium on the campus of the University of Minnesota. Usual tuition fees are \$50 for a two-day course, \$60 for a 2½-day course, \$70 for a three-day course, and \$100 for a one-week course.

Specific announcements are sent out about two months prior to each course to all members of the Minnesota State Medical Association and to any physicians who request information for a specific course. For further information write to:

DIRECTOR
DEPARTMENT OF CONTINUATION MEDICAL EDUCATION
THE MEDICAL CENTER (Box 193)
UNIVERSITY OF MINNESOTA
MINNEAPOLIS, MINNESOTA 55455



If a college has not succeeded in persuading its students to give after four years of experience on its campus, after having been subjected to the whole educational program of the institution, it has failed in its mission. If it trains men to "get" but fails to train them to "give," it really has no good reason for existence.

— Edgar M. Carlson

1966

COMBINED MEDICAL ALUMNI FUND

Support the Medical Program of Your Choice