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Cover: John A. Anderson, Professor and Head of Pediatrics, examines a young patient.

OFFICERS

Minnesota Lags in Funding Health Science Training

DR. ROBERT B. HOWARD
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University of Minnesota

To understand the problems involved in financing education for the Health Sciences, one must first recognize the fact that there is *no such thing as a medical school.* What is generally referred to as a medical school in this country is, in reality, a highly complex institution, staff members of which are simultaneously engaged in multiple functions, in an almost unbelievably wide range of interrelated but distinct activities.

They are responsible for instruction not only of medical students, *i.e.*, students studying for the M.D. degree, but also that of graduate students in basic and clinical specialties; for substantial portions of the instruction of other health science students, including those in dentistry, nursing, pharmacy, public health, occupational therapy, physical therapy, medical technology, and still others; for advancing medical knowledge through research; and for rendering medical care to sick people.

Robert B. Howard

INCREASINGLY, medical school faculty members are expected also to participate in certain extra-university activities closely related to their areas of special competence: to consult with governmental and other agencies sponsoring research programs; to participate in local planning for such programs as health care for disadvantaged population groups; and to make available their expertise to agencies determining broad public policy on such matters as population control.

At any given moment a medical school faculty member may be engaged in an activity falling neatly into one of the categories given above. It is more likely, however, that he will be engaged in two or more of these activities at the same time. Assigning appropriate costs to various programs under these circumstances is most difficult. At best, it rests on judgments that can only be arbitrary.

This article is reprinted from the Minneapolis Tribune, which invited Dean Robert B. Howard to present his views on Minnesota's doctor shortage and plans for developing new or expanded medical educational facilities in the state.

THE SECOND THING to be recognized in considering the costs of medical education and of other programs in the health sciences is that they necessarily involve a very large proportion of small group teaching and a very small proportion of didactic lecturing. Most such health teaching takes place around the patient, whose care must obviously be closely and expertly supervised. The teaching is, in effect, individualized with respect both to the patient and to the limited number of students who can be effectively taught at the bedside, in the operating room, or in the out-patient clinic examining room. The large lecture hall plays a modest (but by no means unimportant) role in education for the Health Sciences.

One implication of the foregoing is that when class sizes increase in the Health Sciences, it requires nearly commensurate increases in faculty size, if program quality is to be maintained. Large classes do offer substantial economies of scale, but these relate more to facilities, equipment, and supporting services than they do to numbers of faculty.

Lack of Funding

Any consideration of increasing the size of educational programs in the Health Sciences in Minnesota must take account of the need for adequate funding for operation. Most Minnesotans believe that our state has supported medical education rather richly. *They are surprised to learn that such is not the case.* The State of Washington, with a rather new medical school, invests more than four times as much per student in the operation of its medical school as Minnesota does in the University of Minnesota Medical School; a mountain state invests three times as much. States surrounding Minnesota provide budgets that are, on the average, approximately twice what Minnesota provides. Even *Alabama and Mississippi put more state funds per medical student into their schools than we do.*

HOW HAS Minnesota managed to continue a good quality program despite the low level of state financing? Thanks to an exceptionally able faculty, we have been able to attract research funds in unusually large amounts over the past 15 years. These have been used for partial support of faculty, to a degree far greater than in most other schools. Together with other "outside" funds, they account for slightly more than 75 percent of our total support for faculty.

There are profound implications for a teaching program in which the faculty is largely supported by research and service funds. Further, cutbacks in federal programs have now reached such serious proportions that we can no longer expect to support our faculty from federal sources to nearly the extent we have in the past.

In short, *maintenance of even the present program in medical education will require state funding on a scale substantially greater than what Minnesota now invests.* Implementation of a proposed new curriculum will require funds, as will expanded classes in the present University Health Sciences programs, and any new medical school that might be established. Yet all of these programs are essential if Minnesota is going to be able to continue to provide good health care for its people.

What Happens To Medical Students After Graduation?

IN THE WAKE of World War II, the American public noted with appreciation the remarkable accomplishments of the scientific research community in solving a host of major problems and in consequently bringing about a successful conclusion to the war. It seemed reasonable to assume that the same approach to health problems would bring about similar results in a similarly short period of time.

During the 1950s and 1960s, ever-increasing amounts of federal funds were allocated to the support of basic and applied biomedical research and research training. The assumption was that the fruits of these programs and projects would be quickly translated into better health care for the nation's people. Little attention and essentially no financial support were given, at the federal level, either to the health-care delivery system or to the production of manpower, other than research manpower.

The nation's medical schools found themselves in a dilemma. In a time of sharply rising costs of medical education, including the costs of operation of teaching hospitals, medical schools were confronted with the fact that their basic operating funds, from endowments, tuition, and appropriations, were falling progressively farther behind operating costs.

In these circumstances, it is not surprising that the medical schools avidly sought the abundantly available research funds, not only for support of research but as a means of buttressing the support of teaching programs.

AT THE UNIVERSITY OF MINNESOTA, the Medical School was privileged to have an outstanding faculty, recognized nationally, whose members were able to compete very successfully for research funds. At the same time, Minnesota lagged substantially behind other comparable states in providing basic support for its Medical School, as pointed out earlier. *As a result of these circumstances, the University of Minnesota Medical School became especially dependent on "outside" funds for its basic operation, much more so than most other medical schools of comparable status and quality.*

Distribution of Medical Manpower

Both across the nation and here at home, critics of medical education, increasingly vocal since the mid-1960s, allege that medical schools have tended to become specialist-oriented research institutes, and have not effectively served the health care needs of the areas in which they are located. There is perhaps some merit in such criticisms. Certainly it could be expected that the disproportionate funding system described earlier would result in imbalances in the educational programs.

The University of Minnesota Medical School has attracted a full measure of criticism on this score. Before drawing final conclusions, however, let us take a look at the actual distribution of our graduates, at the career choices they have made, that indicate the extent of their service to Minnesota.

A recent publication of the American Medical Association provides us with certain key information concerning our graduates and those of other medical schools. For each medical school we can determine the proportion of its graduates performing patient care, the proportion in general practice, and the proportion practicing in the state in which they received their education.

THE DATA is given for total living graduates of each school and by five-year groupings of graduates. Thus, a comparison of the career choices of the 1960-64 graduates with those of the total pool of graduates permits a study of recent trends. The table below provides relevant information concerning the state medical schools of Minnesota, Colorado, Illinois, Iowa, Kansas, Michigan, Nebraska, and Wisconsin.

STATE MEDICAL SCHOOLS

	Minn.	Colo.	Ill.	Iowa	Kan.	Mich.	Neb.	Wisc.
Total Living Graduates through 1967	5181	2457	6735	3729	3285	5963	4550	2444
Graduates 1960-64	612	382	881	524	474	858	484	388
Percentage of Graduates performing patient care								
All Grads	87.4	89.9	90.5	89.7	91.7	86.9	91.6	89.4
1960-64 Grads	95.2	87.6	96.0	95.8	95.5	95.1	95.8	94.3
Percentage of Graduates in general practice								
All Grads	28.2	24.4	24.4	30.1	29.5	18.4	22.8	21.6
1960-64 Grads	25.9	22.5	14.8	26.7	20.8	11.8	27.6	18.2
Percentage of Graduates in state where educated								
All Grads	46.7	38.8	45.6	35.7	34.4	44.8	20.3	41.6
1960-64 Grads	48.6	39.2	45.0	40.0	34.8	47.4	26.0	36.5

Sources: Special Statistical Series; Medical School Alumni, American Medical Association, Chicago, Ill., 1968.

MINNESOTA comes off very well when various comparisons are made. Among our living graduates, 87.4 percent are performing patient care, while 95.2 percent of our recent graduates are so engaged. These figures are quite comparable to the figures of other schools and belie the often-heard complaint that recent graduates go into research or other nonpatient-care activities.

With respect to proportion of our total graduates in general practice, we rank third, slightly behind Iowa and Kansas, but we have held our ground statistically in this regard better than either of them. The proportion of our recent graduates entering general practice is closer to the seven-school group experience than is the case with either Iowa or Kansas. Only in the case of Nebraska is the proportion of recent graduates entering general practice higher than the group proportion.

If one looks at the experience of the other large schools, Michigan and Illinois, with respect to the proportion of recent graduates entering general practice, a sharp contrast is evident. Of the total 1960-64 graduates of Illinois 14.8 percent are in general practice, and but 11.8 percent of Michigan graduates, while 25.9 percent of Minnesota's recent graduates have entered this field.

But where Minnesota has an undisputed first place in this comparison is in respect to our *retention rate*, i.e., the proportion of graduates practicing in the state where they received their medical education. *For all Minnesota graduates, this retention rate is 46.7 percent,* for recent graduates 48.6 percent. Both figures are higher than the comparable figures for any of the other seven schools in this group.

WHEN RETENTION figures and general practice figures are considered together, Minnesota's record is especially outstanding, for even those schools with a somewhat higher proportionate production of general practitioners have substantially lower retention rates. Minnesota has been "swimming upstream" with respect to the nationwide trend away from general practice, not enough to reverse it certainly, but to a degree that cannot be ignored.

It is to the credit of the faculty of the University of Minnesota Medical School that this record has been accomplished despite an instructional budget that is one-third to one-half of those provided for most of these neighboring institutions and, further, with maintenance of a national reputation for quality.

A New Health Specialist, the Family Doctor

"**CHANGING** the curriculum," a distinguished medical educator once said, "is accompanied by all of the physical and emotional trauma of moving a graveyard." Undeniably, curricula change slowly and with difficulty. It is to the particular credit of the faculty of the University of Minnesota Medical School that, within a period of about two years, an intensive curricular study has been carried out, and a major revision of the medical curriculum, the first since 1940, has been adopted by an overwhelming faculty vote. It will be implemented in the Fall of 1969, contingent upon necessary financing.

During the curriculum study, trends and concepts emerged as important and urgent reasons for developing a more modern, efficient and attractive curriculum. These trends include the following: (1) a rapid increase in medical knowledge during the past two decades has inevitably resulted in an acceleration of the trend toward specialization of the individual physician and the organization of medical care; (2) an increasing affluence and sophistication of our society, triggering an insistent public demand for better medical care for all citizens; (3) the desirability of considering the entire spectrum of medical training, undergraduate and graduate, as an educational continuum; and (4) a concern that the process of medical education should promote student acceptance of the need for continuing education, for a humane and un-

derstanding approach to the patient, and for a sense of responsibility toward society which recognizes the need for the profession to serve effectively all of the people in that society.

New Curriculum

In recognition of these dynamic trends, our new medical curriculum incorporates the following features: A *"core" curriculum* of essential medical knowledge, the basic body of medical knowledge that all physicians need to know, to the extent that this can be currently identified; an *elective pathway system,* which does away with the traditional "lock-step" medical curriculum and permits the medical student to pursue his special interests in later years of Medical School, a move of particular significance with respect to the new program in family practice (see below); emphasis on the importance of *self-education and continuing medical education*; greater emphasis on *encouraging human understanding* in the future physician by providing earlier experience for medical students with patients and by *emphasizing understanding of social, psychological and economic, as well as medical, aspects of human problems*; establishment of an effective *faculty adviser system*; closer integration and connection of basic medical science concepts and knowledge with clinical teaching; and increased flexibility and tailoring of the program to the educational and professional needs of the individual medical student.

THE EDUCATIONAL policy committee of the Medical School, undertaking its curriculum study, gave first priority to the question of family practice. There was ample evidence that the shortage of family physicians is more acute than the physician shortage in other areas of medicine. The broad outlines of a program were developed by a special subcommittee that included both faculty members and practicing family doctors. This program was adopted in principle by the faculty in late 1967, and the details have been in development during the ensuing period.

Family Practice Department Established

In December 1968, the faculty, giving further recognition to the status of the program and its role within the projected revised curriculum, *voted for the establishment of the program as a regular department, the* DEPARTMENT OF FAMILY PRACTICE AND COMMUNITY HEALTH. This action was subsequently approved by the Board of Regents, and the department is now operative.

The philosophical basis for the establishment of this program is the recognition that family medicine is a specialty, just as are in-

ternal medicine, obstetrics, ophthalmology, etc. It is a broad specialty, to be sure, and its basic body of knowledge thus more difficult to delineate than others. Yet it is obvious that it requires the skill and competence required in the traditional specialty areas. At the national level, Family Practice as a specialty area has been recognized with the recent establishment of the American Board of Family Practice.

RECOGNIZING that the medical student in the academic medical center often has little or no opportunity to work with or to be materially influenced by a physician rendering primary medical care, the Medical School faculty determined at the outset that the program must be offered within the University of Minnesota Health Sciences Center. Certain aspects of it will also be offered at various affiliated or associated units, including hospitals and clinics, within and beyond the Twin Cities. Refinement of the body of knowledge to be taught is proceeding, and we are developing a patient clientele for whom the staff of this department will serve as family physicians.

Each undergraduate medical student will be exposed to certain aspects of the family practice program during each of the first three years of medical school. An opportunity to select the Family Practice Pathway will follow. Early evidence suggests that a substantial proportion of our students will choose this track. The program also includes the development of a Residency Program that will meet the requirements of the new certifying Board in family practice.

The teaching and practice of clinical medicine will be the prime responsibility of the faculty of this department. Faculty will also have scholarly functions, different in kind from, but equivalent in academic respectability to, the functions of the other traditional departments. In particular, the Family Medicine faculty will conduct all important, much needed studies on health care and its delivery. It is this group that will be responsible for setting up models in which new kinds of health care personnel can be evaluated for effectiveness of their contribution.

THE FAMILY PRACTICE program at Minnesota, while not unique, is clearly in the vanguard of this movement in the development of this new, widely sought specialist. This program, together with the over-all curriculum revision, testifies to the foresight and dedication of the Medical School faculty. These new approaches, combined with the increased numbers of graduates from the University's proposed expansion program in the health sciences, will well serve the citizens of the state.

Medical Science

A MICROBIOLOGICAL APPROACH TO DEVELOPMENTAL BIOLOGY*

Martin Dworkin, Ph.D.†

THE developmental biologist is concerned with two general processes: (1) differentiation and (2) morphogenesis. The first refers to the regulated, differential expression of parts of the genome during the course of a life cycle. The second refers to those processes whereby the expression of the genome becomes manifested in the shape or function of the cell.

Apart from the intrinsic academic importance of these problems, they are of profound practical importance to the physician or for that matter. anyone interested in human biology. Certainly anyone dealing with problems of neoplastic growth, aberrant immune response, birth defects or any one of a number of other pathological processes, must be concerned with fundamental aspects of developmental biology.

In the past, developmental biology has been concerned with the life cycles of higher plants and animals. However, during the past decade or so the emphasis has shifted somewhat to include microbes. Much of the spectacular success of biochemistry, genetics and molecular biology has been due to the ease with which microbes, in general, and bacteria, in particular, can be subjected to rigorous, convenient and analytical experimentation. It has become clear that these advantages of bacteria as an experimental system can also be put to use in studying developmental biology. Within this framework then, the purpose of this report is to describe one aspect of our work on a fruiting myxobacterium *Myxococcus xanthus*.

Differentiation

The central problem of differentiation is understanding how, in the context of the life cycle, the cell makes the right amount of the right proteins at the right time. Fortunately, the dramatic advances of molecular biology have given us the techniques and

* From a report to the Staff Meeting of University of Minnesota Hospitals, November 8, 1969.

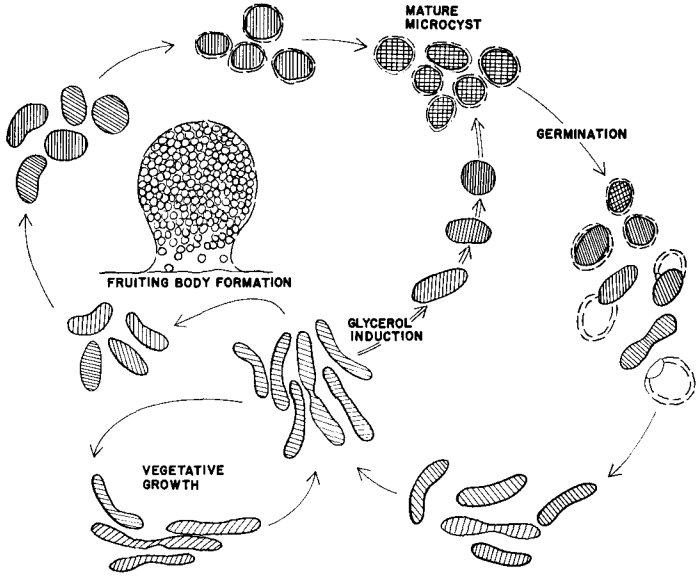
† Associate Professor, Department of Microbiology.

the concepts for approaching this problem. In a bacterial cell, the information for the primary structure of protein is transferred from the DNA in the nucleus to the ribosome, the site of protein assembly, by means of messenger RNA molecules. These messenger RNA molecules, when through with their mission, are broken down and then reassembled at the gene to transmit a new message. In a rapidly growing cell, their life time is brief, in the order of a few minutes. In many developing systems however, the messenger RNA is made, stabilized and retained in the cell for use at a future time when protein synthesis will be required. This occurs frequently in unfertilized eggs, where the process of fertilization somehow activates the previously unused mRNA and the system begins to synthesize protein. In other words, the unfertilized ovum is pre-programmed with the information it will need during a future stage of its development.

A similar situation exists in *M. xanthus* which, as part of its life cycle, forms a resting cell which is metabolically dormant and resistant to heat, desiccation, U.V. light irradiation, etc. This resting cell, under the appropriate environmental conditions will germinate, giving rise to a vegetative cell which grows in a typical bacterial fashion. Our experiments have shown that during the formation of this resting cell, called a microcyst or myxospore, information necessary for its subsequent germination is programmed in stable mRNA which then remains dormant in the resting cell. The microcyst is then functionally exactly analogous with the fertilized ovum and, carrying the analogy on, germination is equivalent to fertilization of the ovum.

Life Cycle

The life cycle of *M. xanthus* is illustrated in Fig. 1. Normally the myxospores are made in the fruiting body, after the vegetative cells have aggregated (presumably in response to a chemotactic substance). Aggregation is followed by the construction of a structure called a fruiting body, within which the cellular morphogenesis of vegetative rods to spherical cells takes place. We have been able to short-circuit this process and to induce the vegetative cells to convert directly to myxospores in liquid media by adding any one of a variety of inducing compounds such as glycerol, phenethylalcohol, or erythritol. The process is rapid, quantitative and synchronous and under the appropriate conditions these artificially induced myxospores will germinate.



LIFE CYCLE OF MYXOCOCCUS XANTHUS

The first indication of the presence of a stable mRNA in the resting cells came when we discovered that germination of resting cells was completely inhibited by chloramphenicol (CAP) but was relatively insensitive to actionomycin D. (Act D). Since the effect of CAP is to inhibit protein synthesis while that of Act D is to prevent RNA synthesis, these data suggested that myxospore germination required protein synthesis but not RNA synthesis, i.e., preformed, stable mRNA was being used as the template. Next, a series of experiments was done to determine when during microcyst formation the germination mRNA was formed and stabilized.

By adding Act D at various times during microcyst formation it was possible to determine that while the developing resting cells had completed their morphological change by two hours, the stable mRNA was not formed until 4-5 hours.

Penetrating the Microcyst

It was then necessary to prove that the Act D was indeed pentrating the microcyst, binding to its DNA and preventing

RNA synthesis while protein synthesis and germination proceeded uninterrupted. Two hour-old microcysts (which had not yet synthesized their stable mRNA and whose germination was still Act D—sensitive) and 6-hour-old microcysts (which had synthesized their stable mRNA and whose germination was now Act D—resistant) were grown in the presence of ^{14}C-labelled thymidine so that their DNA became radioactive. They were then exposed to ^{3}H-labelled Act D which would be taken up by the cells and bound to the DNA. The ratio then of $^{3}H/^{14}C$ in the isolated DNA would be a measure of the efficiency of penetration and binding of the antibiotics. The ratios were very similar for both ages of resting cell, ruling out the possibility that the failure of the antibiotic to inhibit germination of the resting cells was due to a failure in uptake.

Next the effect of the Act D on the synthesis of RNA was directly determined. Six-hour-old microcysts were allowed to incorporate the radioactive RNA precursor, ^{3}H-uridine, in the presence and absence of Act D. The antibiotic had inhibited RNA synthesis by about 95% by the time germination took place.

The ability of six-hour-old microcysts to synthesize protein in the presence of Act D was directly demonstrated. 2-hour-and 6-hour-old resting cells were allowed to incorporate ^{14}C-labelled tyrosine into protein in the presence and absence of Act D. In the 2-hour-old microcysts protein synthesis was severely inhibited by both CAP and Act D. In 6-hour-old microcysts Act D had no effect on protein synthesis for the first 45 minutes, shortly after which germination took place.

Finally, we have examined more directly the nature of the RNA made at various times during the formation and maturation of resting cells. The cells were pulsed briefly with radioactive precursors of RNA. The RNA was then isolated from the cells and analyzed by centrifugation through a sucrose density gradient and by acrylamide gel electrophoresis. The results have indicated that the process of message stabilization is applied not solely to the mRNA required for synthesizing the germination proteins, but rather to the mRNA synthesized from a large segment of the cell's genome.

Some of the questions which remain and which we are attempting to answer are: (1) What is the nature of the process which stabilizes the mRNA? (2) What is the regulatory process

whereby the stable mRNA is not used for protein synthesis? (3) Upon germination, what is the trigger which makes the stable mRNA available for protein synthesis?

This work was done in collaboration with Dr. William S. Ramsey, under NIH grant Nos. AI-08036-02 and R.C.D.A. GM-5869-07.

Radiation Therapy

NEW EQUIPMENT FOR RADIOTHERAPEUTIC TREATMENT AT UNIVERSITY HOSPITALS

K. K. N. Charyulu, M.D.†
and
Vaughn C. Moore, Ph.D.‡

Before 1950, X-ray machines produced skin damage, thus limiting the dosage which could be delivered to deep tumors. During the last 10-15 years much more energetic radiotherapeutic machines have been developed, including Cobalt teletherapy units, betatrons, and linear accelerators. It is generally agreed that better cure rates are possible with these higher powered units with less discomfort to the patients.

In addition to Cobalt teletherapy and conventional X-ray units now available at the University of Minnesota, we are adding a 13 Million Volt Linear Accelerator, a Universal Treatment Simulator, a Transverse Axial Tomography Unit and a Treatment Planning Programmed Console Computer.

The linear accelerator will be the first of its kind in the U.S. in that energy range. The equipment is capable of accelerating electrons to velocities near the speed of light. These fast moving electrons may be used directly on the patient or they may be made to strike a target within the machine to produce high energy X-rays which may then be used for therapy of deeper tumors.

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THE IMPORTANT features of the *13 Million Volt Linear Accelerator* are (1) X-ray doses up to 500 rads per minute at one meter, (2) Electron doses up to 100 rads per minutes at one meter, (3) 3 mm focal spot size, and (4) Energies up to 13 million volts. These features give rise to the chief advantages of a linear accelerator. These are

(1) The X-ray beam has sharper edges than a cobalt beam due to the small diameter of source of X-rays. This then will allow treatments of tumors in the vicinity of critical organs such as the eye or the spinal cord with greater ease.

(2) The treatment time would be shortened due to the high dose rate. Uncomfortable patients and children could be treated in a very short period of time.

(3) A single portal of a 12 million Volt electron beam would effectively treat a cancer of tonsil, while sparing salivary glands and taste buds beyond the range of electrons. It is thus possible to minimize the dryness of the mouth and loss of taste in such patients. A six million Volt electron beam penetrating tissue up to 1 cm and no further is ideal for treating superficial lesions such as mycosis fungoides.

The *Transverse Axial Tomography unit* obtains the X-ray of the cross section of the body in a plane. It consists of a diagnostic X-ray tube mounted at one end of a C-shaped arm capable of swinging around a horizontal axis. The film is mounted on the cassette holder at the other end. The patient lies on a couch underneath.

Transverse tomography permits localization of tumors with respect to the cross section of body. Such information will help to mark the patient for radiation therapy.

The *Treatment Simulator* would simulate any treatment plan which ordinary diagnostic equipment would not permit. It would be possible with the help of the machine to visualize accurately the tissues transversed by radiation therapy beam. The treatment fields and their orientation can be adjusted if unsatisfactory. Basically, the simulator uses an ordinary diagnostic X-ray tube in place of the therapy source. It has an image intensifier coupled to a TV monitor. The C-arm on which these units are mounted, can be rotated around a horizontal axis. Its chief use is in the preliminary planning of Radiation Therapy.

With the help of such a treatment simulator the radium insertions of cancer of cervix can be visualized on the TV screen. The

simulator would then permit the super-position of x-ray fields. An integrated scheme of therapy of cancer of cervix is thus visualized. The equipment would also enable more accurate Radium implants under direct vision.

The *small computer* was developed by the Washington University Biomedical Computing Laboratory in St. Louis and has been applied to radiation therapy problems by several institutions. It can operate in either of two modes: (1) autonomous mode — where all the computations are performed by the computer itself and (2) collaborative mode — where the computer functions as a remote terminal for a larger computer.

THE COMPUTER SYSTEM consists of a memory or brain, a central processing unit, a typewriter keyboard, a storage cathode ray oscilloscope, a mechanical device to draw in patient contours and other information and a magnetic tape-card read-write unit. There are four connections for sampling external voltages.

Patients being treated with X-rays or cobalt gamma rays will receive treatments with the beam of radiation entering them from various directions. The effects of the radiation dosage contributed by each beam are cumulative and may be determined by summating the isodose curves * into an overall treatment plan. Such calculations may be done by hand or by means of the small computer.

A good treatment plan will be one in which the beams of radiation are so arranged that the tumor and a small safety margin are irradiated with a tumoricidal dose with minimum radiation dose to the surrounding healthy tissue, in particular certain critical organs such as the eyes, kidneys, spinal cord, lungs, etc. An experienced dosimetrist may spend several hours preparing a single treatment plan for a patient. This plan may not be the best possible plan. If refinements are required, the dosimetrist must start all over from the beginning. The programmed console computer can reduce the time for a single plan to a few minutes or even seconds. If a particular plan is not the most desirable, changes can be effected quickly and a new plan determined in the same period of time. As a result, it is within practicality for an "optimum" treatment plan to be worked out for each patient undergoing therapy.

* An isodose curve may be defined as a curved line drawn upon an outline of a patient to represent the region in which the radiation dose rate is constant. A set of isodose curves for a given set of geometrical conditions consists of several isodose curves which differ by five or ten percent.

EVENTUALLY a computational service will be offered to radiation therapists in the surrounding communities and probably other states as well. For this service, a communication network can be set up between the University and the outlying facility.

The Linear Accelerator described above incorporates several important specifications given by Prof. Skaggs of the University of Chicago and one of the authors (K.K.N.C.). The treatment simulator the special couch, and their alignment with the transverse axial tomography unit are the result of the author's (K.K.N.C.) design specifications.

Medical School News

Dr. Owen H. Wangensteen, professor emeritus of surgery, was named *Outstanding Living Minnesotan* of 1969, an award conferred for the first time this Spring in connection with the state's 111th birthday anniversary.

Dr. Wangensteen received the first Gopher Statuette at a dinner in the St. Paul Hilton Hotel. His selection was made by the Minnesota Anniversary Recognition Committee, in honor of his major contributions to medical research and teaching at the University of Minnesota.

Frederick M. Stone, a Medical School junior, was awarded an International Fellowship by the Association of American Medical Colleges and the U.S. Public Health Service. He will spend 10 weeks this summer working at the Tel Hashomeer Government Hospital, Tel Aviv University, Israel.

The Minnesota Department of Health has moved into its new building at Oak and Delaware Sts. SE, near the Medical Center. Also housed in the new structure, due to be dedicated in July, is the headquarters of the Minnesota Pollution Control Agency.

The Health Department was formerly housed in three locations, with principal headquarters since 1938 in the Psychology building on the University campus. Efforts to provide a new building for the burgeoning department began in 1957, and construction began in 1967.

The Minnesota Epilepsy League recently honored three Medical School faculty members for outstanding service to the League. They are **Dr. Richard Zarling** (Neurology), **Dr. Robert J. Gumnit,** (Neurology), and **Dr. William Heilig** (Pediatrics).

Dr. Paul Frick, former chief resident in Medicine and later an instructor in the Medical School, was recently appointed Professor and Head of the Department of Medicine, University of Zurich, Switzerland.

DERMATOLOGISTS HONOR DR. HENRY MICHELSON

Dr. Henry E. Michelson, (Med. '12) Emeritus Professor of Dermatology and holder of the University of Minnesota *Outstanding Achievement Award,* recently received additional honors in connection with his 80th birthday. Having retired as Director of the Division of Dermatology in 1957, Dr. Michelson has continued actively in the teaching program, at the Medical School and also at the Minneapolis V.A. Hospital as a consultant and regular participant in the undergraduate and graduate teaching there.

Honoring Dr. Michelson was a principal purpose of a *Conference on Bulbous Dermatoses*, a course in the Continuing Medical Education Program, held October 18-19, 1968. The Minnesota Dermatological Society sponsored a clinical meeting and a dinner where Dr. Michelson was greeted by more than 100 dermatologists, including numerous former students and trainees. Reminiscences were provided by **Dr. John R. Haserick,** (Med. '40) of Case Western Reserve, **Dr. Robert R. Kierland** (Med. '32) of the Mayo Clinic, and **Dr. Louis H. Winer,** (Med. '25) of Beverly Hills, Calif.

Members of the visiting faculty for the conference were Drs. Walter F. Lever, Tufts University, Carl T. Nelson, Columbia University, Robert W. Goltz, (Med. '44) Colorado Medical Center, and Dr. Haserick. Drs. Winer, Haserick and Goltz received both undergraduate and graduate training at the University of Minnesota. Dr. Kierland graduated from the Medical School and Dr. Nelson is a former intern of the University Hospitals. Speakers at the Conference included all members of the Mayo Clinic Section on Dermatology.

Alumni Notes

△ 1919

Five members of the Class of 1919 have been admitted to membership in the "Fifty-Year Club" of the Minnesota State Medical Association, denoting 50 years of medical practice and association with organized medicine. Honored May 26, 1969 by MSMA were **Donald H. Daniel, Claude J. Ehrenberg, Charles Hymes, Thomas J. Kinsella,** and **Adam M. Smith,** all of Minneapolis.

△ 1937

John Henry Aldes

John Henry Aldes received the University of Minnesota's *Outstanding Achievement Award* at the 65th annual meeting of the Minnesota Alumni Association this Spring. He is director of the Ben R. Meyer Rehabilitation Center, Cedars-Sinai Medical Center, Los Angeles, Calif. Following a distinguished career with the medical corps in World War II, Dr. Aldes began orthopedic and related rehabilitation work with several California hospitals and medical centers, where he has become one of the profession's foremost authorities in his field. Dr. Aldes is the 37th graduate of the Medical School to receive the OAA, highest honor presently conferred upon graduates by the University of Minnesota.

Harry A. Hanson is the newly appointed associate medical director of the Eastman Kodak Co., Rochester, N.Y. He is also on the faculty of the University of Rochester School of Medicine.

△ 1940

Harry A. Wilmer, clinical professor of psychiatry at U-C in San Francisco, has won a *Guggenheim Fellowship* for 1969-70, to write a book based on his experience of running an adolescent ward for patients involved with drug usage.

△ 1947

Truman A. Newberry is surgeon and assistant superintendent of medical-surgical services at Stockton, Calif. State Hospital. He's a member of MENSA and is currently mentioned in *Who's Who in the West.* The Newberrys have three daughters and live at 520 E. Acacia. Truman earned a Ph.D. in cancer biology from the University of Minnesota in 1953.

△ 1949

James M. A. Weiss is completing a year's leave as Visiting Professor at Cambridge University, England. He has been professor and chairman of Psychiatry at the University of Missouri since 1960, and was recently elected a Fellow of the *Royal Society of Health of England.*

△ 1950

N. L. Gault and **Sarah J. Gault** write from the Pacific: *"The Gaults are completing two years with the University of Hawaii Postgraduate Medical Education Program for the Ryukyu Islands in June, and are moving to Honolulu where both will be involved with the School of Medicine, University of Hawaii."* Neal has been medical director at Okinawa Central Hospital; Sarah has been the advisor in PM & R. Since the beginning of the Ryukyu program in 1967, 33 Okinawan trainees have returned from Japan to participate in the program, more than tripling the full time medical staff of the Hospital. The Gaults' new address is 3675 Kilauea Ave., Honolulu, Haw. 96816.

△ 1954

Richard E. Anonsen, who is in general practice in suburban Minneapolis, is current president of the Hennepin County Medical Society.

Oleg Jardetzky was appointed executive director for basic medical sciences of the Merck Institute for Therapeutic Research in New Jersey. He is former assistant professor of pharmacology at Harvard Medical School.

△ 1956

James R. Pluth has been appointed a consultant in general surgery at the Mayo Clinic, Rochester, Minn. His specialty is thoracic surgery.

△ 1957

Jerome H. Modell has been appointed professor and chairman of the Department of Anesthesiology at the University of Florida College of Medicine. He will take his new post in Gainesville, Fla. on August 1, 1969. Dr. Modell is regarded as a world authority on the treatment of near-drowning victims, being the author of many scientific papers on inhalation therapy and intensive care. He has been in the faculty of the University of Miami since 1963.

△ 1962

William D. Erickson writes that he is leaving private practice in Jamestown, N.D. on July 1, 1969, and will join the pediatric staff of the Geisinger Medical Center, Danville, Pa.

Robert D. Flaig is finishing an orthopedic surgery residency on July 1, 1969, and will "remain in the San Francisco area."

Bruce D. Howard is a Lt. Cdr. in the U.S. Navy, presently stationed in Taipei, Taiwan. He was drafted in July 1968 from his job as assistant professor of biological chemistry at UCLA, and is now engaged in research in Asiatic cholera for the Navy. His wife, Rosanne, and small daughter, Leslie, are with him.

Army doctor **Richard Reem** writes: *"Greetings from Alaska. I enjoy receiving the MEDICAL BULLETIN and discussing the 'good old days' with fellow Minnesotan Dave Drill. Although I am a pediatrician, I am assigned here at Ft. Richardson as post surgeon . . . a challenging job in many ways. My wife and 3 children are here . . . our address is 522 A. Beluga, Ft. Richardson, Alaska 99606."*

△ 1963

Arnold P. Hageman is board certified in radiology and now chief of the service at the USNAS Hospital, Corpus Christi, Tex. Arnie intends to return to Long Beach, Calif. to private practice after Navy service is concluded in August, 1969.

Robert D. Hanek is now a partner-owner in his clinic, writes wife Judy Hanek, Fairbanks, Alaska, "and it looks like we plan to stay here a long time." The Haneks have bought a home, and survived a "miserable winter with many −60 degree days, yet we love it!" They live at 1114 Riverview Dr., Fairbanks.

△ 1964

Maj. John G. Bergstrom visited the Medical School this Spring on leave from Army service in Ethiopia. He will return to the University January 1, 1970 to resume a residency in internal medicine. His wife and two children are with him in Africa.

Tom Canfield forwards his membership dues to the Foundation and reports he's still in the Army, stationed at the Armed Force Institute of Pathology, Washington, D.C., as acting chief, legal medicine section, Forensic Pathology Branch. Tom spent two years of Army duty in Germany, says he likes his job which involves teaching lawyers and MP's the medical-legal intracacies.

Linda and Tom Canfield were expecting their first child in May, 1969. They live in Laurel, Md., and Linda has been working as a nurse until recently.

Clayton A. Johnson and **Richard Langer,** classmates, are associated in general practice with the Molokai Clinic, Molokai, Hawaii. ". . . Among four physicians on the island serving 6500 people. We find the practice rewarding and interesting . . . are able to enjoy the sailing, fishing, and hunting of this area." Their address is Box 218, Kaunakakai, Molokai, Haw. 96748.

△ 1965

Lee Beecher completes a residency in psychiatry this summer and writes that he and **Nancy (Med. '66)** will be with the Navy at Pearl Harbor for the next three years.

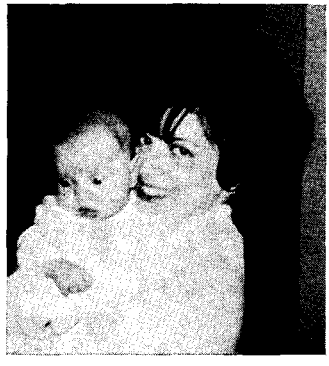
James L. Halverson will complete three years in the Air Force this year, and will return home, according to his parents. Jim has been stationed in the Netherlands. His wife and daughter are with him.

J. M. McMillin

Capt. John Michael McMillin was awarded a second Bronze Star Medal for meritorious Army service in combat operations in Vietnam. He earlier was decorated for heroism, and also received the Air Medal.

△ 1966

Avie Overbach Cohen furnishes a photo of her new daughter, Jennifer, born on Christmas Eve, 1968. Avie and her husband, Ron, intend to remain indefinitely in Birmingham, Ala., where Ron is employed, and where she has been a resident in pediatrics. She hopes to join the staff of University of Alabama Hospital.



Avie Cohen

△ 1966

Stephen L. Hanson will complete his Army duty in June, 1969 and return to Minneapolis to join in Family Practice with Drs. Quello, Engstrom, Kovak, and O'Neill. The Hansons have two children and are building a home in Bloomington, Minn.

Robert P. Nelson announces the opening of his office for General Practice at 1031 Payne Avenue, St. Paul, Minn., tel. 774-9355.

Capt. Paul (Dick) Pedersen, resident in medicine at Walter Reed General Hospital, has been commissioned into the regular Army.

Gaylan Rockswold will begin a residency in neurosurgery at University of Minnesota Hospitals on July 1, 1969, having completed two years service in the USPHS.

Kent Wilson completes his USPHS tour of duty and returns to the University of Minnesota Hospitals on July 1, 1969 to begin a residency in ENT.

△ 1967

Thomas E. Leet was married Jan. 11, 1969 in Minneapolis to June Polito of Newton Square, Pa., who was a nurse at Philadelphia General Hospital where Tom interned. Tom is a captain in the Army Medical Corps, currently at Kirk Army Hosp., Aberdeen, Md. He expects Vietnam duty before returning to private practice.

Sarah (Sally) Nunneley was recently featured in the University of Minnesota *Alumni News* magazine, being described as *"probably the first woman physician to specialize in aerospace medicine."* She is one of three new residents in the Ohio State University's Department of Preventive Medicine, who have decided to make aviation and space medicine their careers. Sally holds a private pilot's license, and *"hopes to make contributions to the space program."*

△ 1968

James Balow and his wife, Mary, are relocating July 1, 1969 in Washington, D.C., where Jim will begin a residency in Internal Medicine at Georgetown University Medical Center.

MEDICAL ALUMNI ASSOCIATION WINS AWARD

The Minnesota Medical Alumni Association was host to the Senior Class in Medicine at the traditional luncheon held May 7, 1969. Vice President **George W. Janda (Med. '48)** was toastmaster. **Paul Spilseth** and **Harold Seim** spoke for the Class of 1969.

Featured speaker was **Malcolm A. McCannel** (M.S. '46), Minneapolis ophthalmologist, who discussed *There's Hope For You*, a review of his medical experiences with *Project Hope*.

The Medical Alumni Association, (see photo) was winner of 1968's Outstanding Alumni Constituent Group Award of the parent Minnesota Alumni Association. **Leonard Arling (Med. '36)**, president of MMAA, accepted the award at the March meeting of MAA, from Edwin L. Haislet, executive director.

The Association took honors for the following accomplishments:

Memberships: Selected a class chairman and conducted a membership campaign aimed at the Classes of 1947, 1948, 1949, 1950, and 1951.

Annual Meeting: Held four class reunions, scientific sessions, and presented *Harold S. Diehl Award* to Dr. Ted Fritsche, New Ulm, Minn., with 341 in attendance.

Fund-raising: Raised funds from board members and other alumni and groups for its *Medical Microscope Project.*

Student-Alumni Relations: Sponsored a social hour and dinner for the Medical School Student Council, and Adytum Cabinet, as well as a Senior Class Stag for all members of the Class of 1968.

Faculty-alumni Relations: Served as a liaison between the faculty and the Minnesota Alumni Association, holding many board meetings and committee sessions to strengthen the activities of the Association.

Alumni Deaths

Thomas E. M. Noble/1924

Died January 6, 1969 of bronchial pneumonia in Long Beach, Calif. He was 69 years old, and a veteran of World Wars I and II.

Albert J. Emond/1928

Died April 8, 1969 of acute coronary thrombosis in Phoenix, Ariz. He was 68 years old and had been in general practice in Farmington, Minn. many years until his retirement in 1960. He was later a consultant to the V.A. Dr. Emond was a graduate of St. Thomas College and interned at Miller Hospital, St. Paul. Survivors include his widow, Vivian L., and son, William, Farmington, Minn.

Wallace A. Gleason/1929

Died December 24, 1968, aged 64 years. He was a resident of St. Paul and staff member of St. Joseph's Hospital.

Willard H. M. Peterson/1931

Died December 24, 1968 of heart disease, aged 71 years.

Floyd R. M. Peterson/1943

Died of heart disease December 22, 1968, age 50 years. He was a practicing pediatrician in Los Angeles, Calif., and veteran of World War II.

MEMORIALS

Gifts have been received recently by the Minnesota Medical Foundation in memory of the following:

Roberta M. Abbey
Mrs. Katherine Aldrich
Marda Alexander
Dr. Martin B. Callan
Richard H. Donaldson
Lynn M. Hutton
James E. Lyttle
Mrs. Clarence Maher
Maureen Mikunda
Idah M. Peterson
Dr. Wallace P. Ritchie
Irving Schneider
Mrs. June Smith
Bernard Toth

Memorial gifts are a thoughtful means of honoring the memory of a relative, friend, or colleague. Gifts may be designated for specific purposes. The Minnesota Medical Foundation acknowledges all gifts to both donor and next of kin.

ALUMNI SCENE

Medical School officials are breathing easier.

The Minnesota State Legislature, ending its 1969 session in a flurry of last minute business, approved a state appropriation of $14,000,000 to help support the First Phase of the University's Health Sciences Expansion program. The University thus gained a hard-won green light to proceed with its 10-year expansion of physical facilities and educational programs to relieve the state's shortage of health manpower. It means future production of more physicians, dentists, nurses, pharmacists, and para-medical personnel.

Although matching federal grants must still be obtained, it appears likely that the State of Minnesota has now irrevocably committed itself to backing of a health training expansion costing upwards of $65 million – the largest public funding program ever undertaken in Minnesota.

The Legislature also voted other funds for medical education in the state. It approved a $340,000 grant to the University of Minnesota-Duluth, to plan and develop a program in the basic medical sciences, with an eye toward a new medical school there in the future.

Hennepin County General Hospital received a $400,000 appropriation for development of a Family Practice Specialty Training program. The Mayo Foundation was voted $100,000 to help develop new modes of rural medical practice. Finally, the Northern Association for Medical Education, which has been promoting a new medical school for St. Paul, was voted a state appropriation of $200,000 for further development of its proposal.

Sincerely,

Eivind Hoff

Eivind Hoff, Jr.
Executive Director

EH:CE

Comments and criticisms of remarks appearing in this column are welcome. Indeed, they are solicited. Communication between Alma Mater and the Alumni Family must be two-way. Let us hear from you.

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ALUMNI NEWSMAKER