Wisconsin Academy review: Health care in the eighties and beyond. Volume 31, Number 1 December 1984

Madison, Wisconsin: Wisconsin Academy of Sciences, Arts and Letters, December 1984

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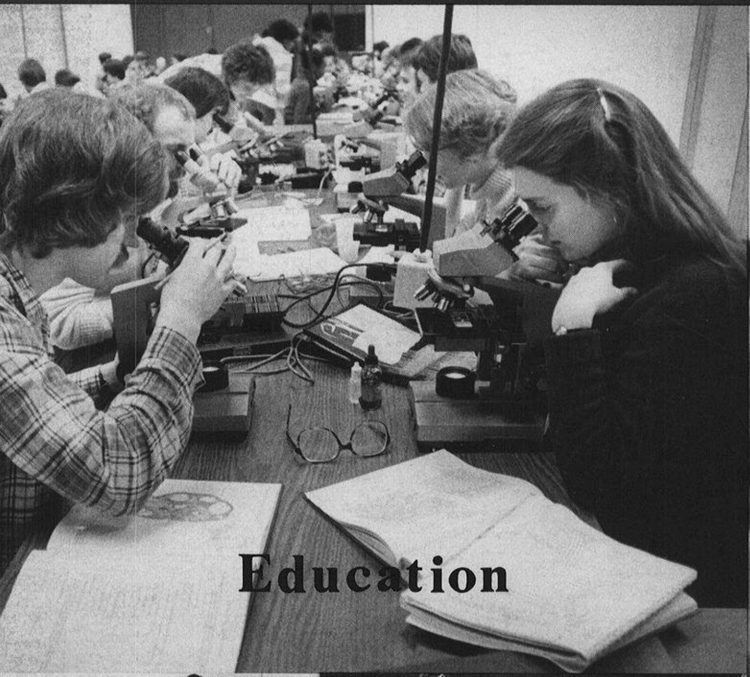
WISCONSIN ACADEMY REVIEW

Published Quarterly by the Wisconsin
Academy of Sciences, Arts and Letters.



Health care in the eighties and beyond

Volume 31, Number 1
December 1984

Wisconsin Academy of Sciences, Arts and Letters

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The Wisconsin Academy of Sciences, Arts and Letters is affiliated with the American Association for the Advancement of Science, the Association of Academies of Science, and the Education Association Press of America.

Typeset by Impressions, Inc.

Printed by American Printing, Madison
Second class postage paid at Madison.

SUBSCRIPTION INFORMATION

The REVIEW is published quarterly by the Wisconsin Academy of Sciences, Arts and Letters, 1922 University Avenue, Madison, WI 53705. Distributed to members as part of their dues. Available by subscription at $15 per year. Individual copies $4.00 postpaid.

Statements made by the contributors to the WISCONSIN ACADEMY REVIEW do not necessarily reflect the views or the official policy of the Wisconsin Academy of Sciences, Arts and Letters.

Letters to the editor, poetry, fiction, line art, photographs, and article proposals are welcome. All correspondence related to the REVIEW or other Academy publications (change of address, single copy orders, undelivered copies, Academy membership) should be sent to the Wisconsin Academy of Sciences, Arts and Letters office.

ISSN 0512-1175

THE WISCONSIN ACADEMY OF SCIENCES, ARTS, AND LETTERS

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On the cover, three aspects of health care: Medical education is illustrated by first-year students at the Medical College of Wisconsin; research is represented by UW-Madison's Dr. Elliot Dick's tests of devices preventing cold virus transmission; therapy is demonstrated by heart surgery at UW Hospitals.

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℞ Wisconsin medicine

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When I was growing up, I saw our family doctor for everything from preschool bronchitis to a precollege crisis of self-confidence. While he was hardly an old, trusted friend, he did know me, my family, our medical history. In the last decade I've seen separate specialists for each complaint, and my current primary physician—for insurance purposes—is someone I've never seen and whose name I don't remember. This depersonalization of health care results from two factors several authors in this issue discuss: increasing specialization and increasing costs.

Another change in health care many of our authors mention is the assumption of personal responsibility for one's own health. We no longer expect our physician to solve our health problems. We understand that it is up to us to maintain our health by proper diet and expertise, by responsible use of alcohol and tobacco, by regulation of the stress we experience. We have to become informed about environmental risks and occupational hazards likely to affect us. And when a breakdown of good health sends us to a doctor, we ask questions about the diagnosis, push for information about the disease and its effect on us and our families. We consider alternative treatments, weigh risks.

It is, however, far easier to be passive than active in our encounters with doctors. We have been conditioned to defer to the doctor's authority. Moreover, the doctor's office, staff, and appointment planning all reenforce this authority by presuming that the doctor's time is valuable and the patient's is not. Too often after a patient has been waiting impatiently for an hour, the doctor breezes in with a pseudosocial "How are you today?" or "What seems to be the problem?" The appropriate social response to the first question is the inappropriate "Just fine," to the second a whining complaint. Finally, after years of being dismayed by my submissive behavior in the doctor's office, I learned when I make the appointment to write down symptoms with dates and diagrams if necessary, possible associated problems, any family medical history which might be relevant. This list is my answer to either question. The information need not be drawn out by the doctor who may ask the wrong questions or whose behavior can make one forget pertinent information. After the examination I write down the doctor's explanation to make sure I ask appropriate questions, compare symptoms and diagnosis. Then I file the information at home as family medical history, to be consulted, perhaps, by me in two decades or by my children to complete their medical history.

Several authors in this issue note that doctors must learn more each year—that medical knowledge is geometrically increasing. Not only health care professionals but all of us have to learn more about potential health hazards and practical health care. This issue has provided me, and I hope you, with useful and interesting information about medical progress in controlling diseases and problems of health care our society faces. But this medical progress is forcing on us ethical dilemmas. When available treatments cannot provide an acceptable quality of life, who should decide to terminate that life—the medical establishment? the legal establishment? the government? the family? Must we relinquish control of our lives when we enter the hospital? I prefer James Crow's humane solution.

I am personally as well as editorially grateful to the twenty-eight authors who took time to write these articles to give readers more of what we need—information tempered by wisdom.

Patricia Powell

Authors

Edward J. Lennon is president of the Medical College of Wisconsin. He received a B.S. in zoology and an M.A. in German literature and language from the University of Illinois and an M.D. from the Northwestern University School of Medicine. An internist with a subspecialty in nephrology, he is professor of medicine at the Medical College of Wisconsin. During his twenty-six years with this institution he has served sequentially as chief of the renal service, director of the Clinical Research Center, associate dean, dean, and president.

David A. Kindig is vice chancellor for health sciences and professor of preventive medicine at the UW-Madison. He earned both M.D. and Ph.D. in pathology from the University of Chicago Medical School. His clinical training is in pediatrics. He has served as administrator in the federal government, in an urban neighborhood health center, and as director of a large teaching hospital in New York. His teaching and research interests are in the supply and distribution of health professionals, in health care for underserved populations, and in medical administration.

A native of South Africa, **Thomas C. Meyer,** received his medical training at Witwatersrand University and specialized training in England, Canada, and the United States. He is professor of pediatrics at UW-Madison and has been chairman of the UW-Extension department of continuing medical education since its formation in 1965. He has served as associate dean of the medical school and is currently director of its independent study program and medical scholars program. Nationally he has chaired and served on numerous committees concerned with research in medical education and the definition and measurement of quality of patient care. **Richard H. Hansen** is director of continuing medical education and chairman of the allied health program unit of UW-Extension.

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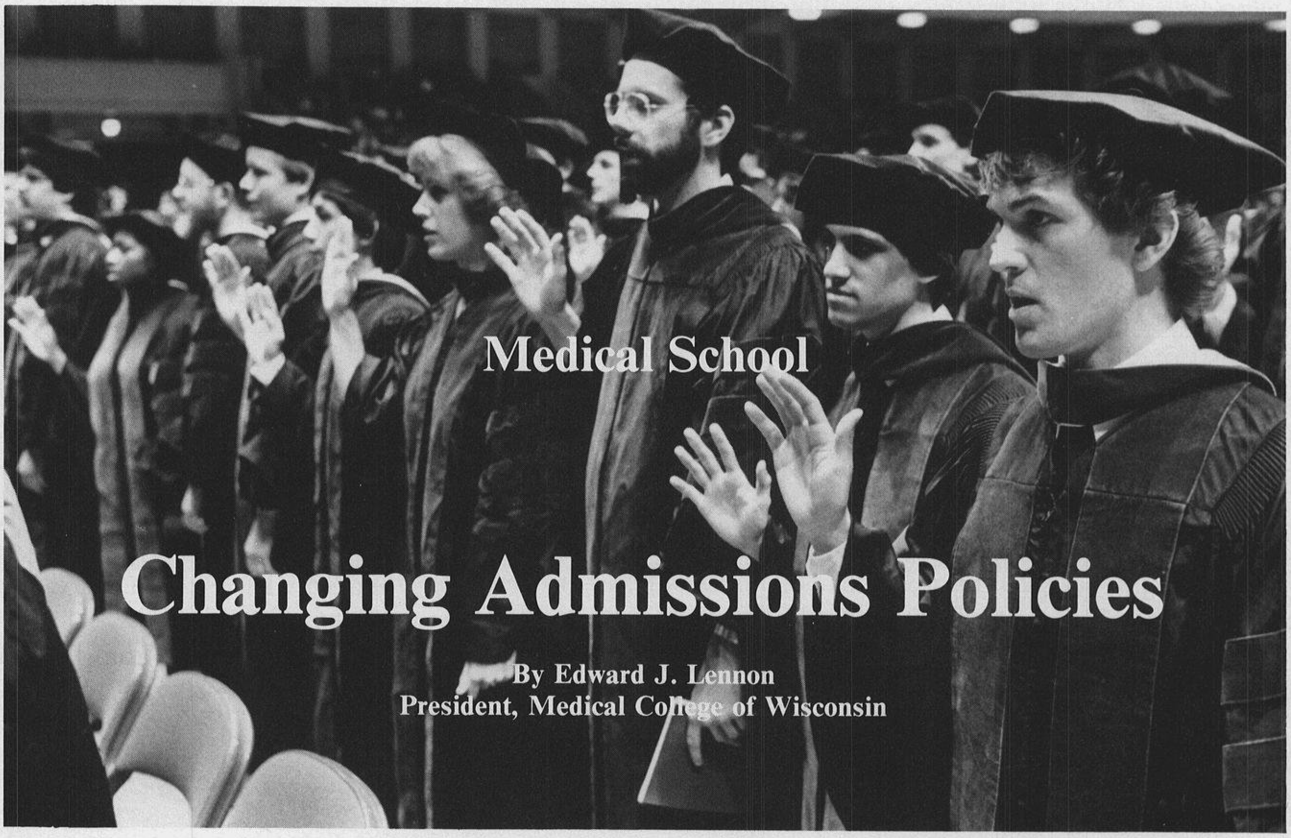


Medical School

Changing Admissions Policies

By Edward J. Lennon
President, Medical College of Wisconsin

Selecting applicants for admission to medical school has never been a completely satisfactory process. Admissions committees attempt to identify students who have the intellectual capacity and tenacity to deal with the rigors of medical school and residency education, who have the integrity, stability, and compassion to interact effectively with patients, and who have sufficient breadth of personal and educational experience to be capable of relating to the diverse populations of patients they will serve.

The problem is that the number of applications which must be processed is very large. Although the ratio of first-time applicants to total places available in U.S. medical schools is only approximately two to one, the typical applicant applies to approximately nine schools. Thus, at MCW we receive about 3000 applications for the 200 places available in the freshman class. Dealing with such large numbers forces the use of surrogate measures for some of the desired attributes. The yardsticks applied are variably reliable and sometimes elastic. The initial selection of students for interview at MCW is made by rank order on a "tape score" which is a weighted composite of performance on the Medical College Admissions Test (MCAT) and college grades. Special weight is given to the areas of science and quantitative ability. (In return for state capitation, MCW accepts 56 percent of the class from Wisconsin residents. The Admissions Committee thus deals with two applicant pools—Wisconsin residents and out-of-state students.) The MCAT, developed to correct a high academic failure rate among medical students prevalent before its introduction, is a reliable predictor of student performance during the first two (basic science) years of medical school and on the Part I National Board Examinations (taken at the end of the second year). However, since the MCAT is a multiple-choice examination, as are most college examinations and as are the National Boards, some are concerned that the entire sequence is biased in favor of those who have the knack (and there is a knack) for doing well on multiple-choice exams.

Admissions committees know that college grades may be affected by the varying quality of student bodies, the standards of individual colleges and universities, and differences in grading practices among instructors teaching the same course in the same institution. Committee members are aware that courses having the same name may have different contents. They are mindful of the influence of diversionary social, psychosocial, and glandular forces on young adult's academic performance. But none has yet found a way to expunge these confusing variables.

The interview, along with letters of recommendation (traditionally suspect), attempts to assess all of the noncognitive attributes seen as important by the interviewers. This is difficult, if not impossible, to accomplish in a thirty-minute contact with an anxious applicant. In earlier years at many medical schools, one individual, usually the dean or an associate dean, picked the class. This ensured uniform interviews—and a class consistent with one person's bias. Now, at MCW and most medical schools, a sizeable number of faculty members—and often students, alumni, and lay persons—participate in the process. Each candidate is evaluated by two or three interviewers. Each interviewer is asked to evaluate the applicant in terms of honesty, capacity for moral judgment, motivation, self-discipline, empathy, emotional stability, maturity, and medical and nonmedical interests. This provides a more democratic assessment, but still hinges on the luck of the draw—how the interviewers and the candidate interact in a brief encounter. Moreover, since applicants with lower "tape scores" are not interviewed, the interview takes on the role of screening out students who have already been adjudged academically capable but are found wanting on other grounds. The interview is not used to screen in students whose "tape scores" are slightly lower, but who might have superior human attributes. In sum, while the students admitted each year are excellent and a source of institutional pride, we are concerned that other equally worthy applicants may be overlooked.

A second consequence of the admission process prevailing in medical schools is its influence on the applicant's undergraduate college experience. Although medical schools assert with sincerity that they seek students with broad and diverse educational backgrounds—and, indeed, a review of students admitted substantiates this—the admission process sends a different message. The pre-med syndrome is familiar to all college and university faculties. Students planning to apply to medical school tend to overload their curricula with science courses. More importantly, they tend to avoid challenging, upper level courses in all fields to avoid the risk of a "C" (or worse) viewed with some validity as a fatal blow to a medical school applicant. Extracurricular activities are apt to be foregone in favor of more hours of study. While this is assuredly not a universal description of aspiring medical students, being a pre-med can invite a joyless, juiceless college experience and a strategic avoidance of the riches of the university.

Because of the amount of study and training in medical school, many medical educators believe that during undergraduate education pre-medical students should pursue a broad liberal arts background and develop good communication skills.

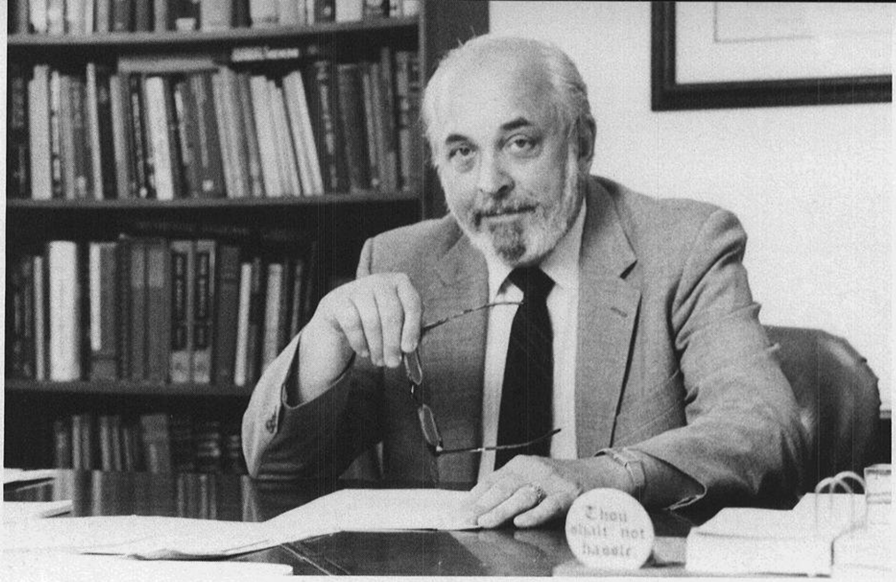
To address these two problems—how best to select future physicians and how to maximize the rewards of the undergraduate collegiate experience—the Medical College of Wisconsin has initiated a new exploratory program. The concept of the new program evolved from a number of assumptions. First, we believed that the faculty of an undergraduate college could, after two years of interaction, better identify students with the personal attributes sought in a physician than could an admissions committee during half-hour interviews. We thought this would be especially true of colleges of modest size, with faculties of acknowledged excellence, relatively low student/faculty ratios, and located in smaller communities where students lived on or near the campus. Second, we believed that if the obsession with grade point averages and Medical College Admissions Test scores could be allayed, students would be liberated to tackle tougher, more challenging courses. The intent was to permit students to pursue their intellectual interests in depth regardless of the field of study.

There was extensive discussion and debate within our faculty about the merits of the assumptions, the wisdom of straying from customary practices, and how such a program might be constructed. After many months, a pilot program was designed and approved.

It was agreed that MCW would invite Beloit, Lawrence, and Ripon colleges to be the initial participants in the pilot program. Their faculties would each be asked to nominate annually four students completing the sophomore year and adjudged to be particularly well suited to become physicians. The nominees would be interviewed by MCW's Admissions Committee and, if the committee concurred, be guaranteed admission to MCW provided that four conditions were fulfilled. The students would be obliged to take the modest number of courses required by MCW, to graduate from their college with any major of their choosing, to maintain a minimum grade point average of 3.0, and to attain a minimum total score of 50 on the Medical College Admissions Test, which they would take during their junior year of college. The academic hurdles proposed by the admissions committee seemed modest indeed considering that the mean grade point average of classes currently admitted to MCW hover between 3.6 and 3.7 and that the national average for all students taking the Medical College Admissions Test is 55.

Both administration and faculty at Beloit, Lawrence, and Ripon accepted the concept with enthusiasm and have contributed much to working out the details of implementation. We will continue to work together to design appropriate measures of outcome. This will require following student performance through medical school, residency, and into practice.

Many interesting questions await answers. What majors will these students elect in the undergraduate college years? Will they, as we hoped, opt for challenging advanced courses? Will some use the relatively secure admission to MCW as a "safety net" and elect other medical schools if admitted?



Edward J. Lennon, M.D., became president on July 1, 1984 of the Medical College of Wisconsin, the third largest private medical school in the nation and the second leading research institution in Wisconsin.

How will they fare during the basic science years, the clinical years, and in residency? What fields of medicine will they choose? Most important, will they fulfill society's expectations of a "good doctor"?

Other experiments are running in parallel. The "Target M.D." program with the UW-Milwaukee was initiated eight years ago. Students completing high school are selected jointly by the faculties of UW-Milwaukee and MCW for admission to the program. Twenty students are accepted each year. The students spend three years at the UW-Milwaukee where they have a number of courses specifically tailored toward preparation for medical school and seminars in medically related areas jointly taught by MCW and UW-Milwaukee faculty. Their academic performance is then reviewed by MCW's Admissions Committee; interviews are held to assess the student's current status; and, with few exceptions, they are then admitted to MCW. The program shortens the college-medical school continuum by one year, reduces stress during the undergraduate years by providing relative assurance of admission to medical school, and provides additional special background for the medical school experience. All evidence to date indicates that the "Target M.D." students, although entering after three rather than four years of college, perform at least as well as their classmates in medical school.

The program for "Pre-Medical Scholars" with Marquette University is specially designed for the high school senior who is ready to make a commitment to a liberal education and a medical career. Marquette University enrolls fifteen students per year from high school in the "Pre-Medical Scholars" program. The undergraduate portion of the program takes four years and includes a bachelor's degree from Marquette University. Students must enroll in the College of Arts and Sciences at Marquette to participate in the "Pre-Medical Scholars" program. Required undergraduate courses in biology, chemistry, and physics develop the strong science background needed for medical studies. However, a wide choice of undergraduate majors is available with flexibility to take many different courses in the humanities and social sciences. Through this program, students may develop historical, philosophical, and contemporary social perspectives as well as personal qualities important to life both as a person and as a physician. The students can fulfill the required courses for acceptance to the Medical College of Wisconsin by the end of the sophomore year.

The Medical College of Wisconsin is a private, free-standing, non-university related institution. In addition to educational programs for 800 medical students, the college is responsible for sixty-five students enrolled in M.S. and Ph.D. programs in the basic medical sciences (anatomy, biochemistry, biophysics, microbiology, pathology, pharmacology and toxicology,and physiology), 194 nursing students, and 607 resident physicians in all of the medical specialties in our affiliated hospitals.

The programs developed with the UW-Milwaukee, Marquette University, Beloit, Lawrence, and Ripon have facilitated interactions between our faculties which are beneficial to the academic welfare of our institutions. Joint research programs have been fostered, bridges built between disciplines, and fruitful discourse about the nature of college and medical school educational content and process initiated.

It is of critical importance that the students who will become physicians have a sustained intellectual curiosity and a disciplined habit of independent study throughout their professional careers. The sciences on which the practice of medicine rests have grown and are growing at an explosive rate. The experiments described above are intended to foster attitudes and habits that will help keep pace with new knowledge, but the curriculum of the medical school also requires critical evaluation. As the knowledge base has grown, the content of all medical school courses has expanded by accretion. Enormous amounts of factual material are crammed into lectures, published in rapidly outdated books, and regurgitated in examinations. The sheer volume of facts tends to obscure the more durable concepts and principles. There is little doubt that physicians of the future will call up factual detail on desk-top computers linked to national updated data banks. The opportunity to revise the curriculum to focus on basic concepts which facilitate genuine understanding, and to foster independent study and problem solving is at hand, but has yet to be fully exploited. The future of medical education holds both challenge and excitement.☐

Competence and Compassion in Medicine

Medical Education for the 21st Century

David A. Kindig

By David A. Kindig
University of Wisconsin-Madison

The task of outlining the essential characteristics of medical education in the coming decades is extremely challenging and risky. The nature of health care delivery and medical practice will undoubtedly be considerably different from what we know today. As other articles in this volume indicate, the degree and direction of the changes is difficult to predict. In addition, there is not necessarily a simple relationship between the nature of the educational process and the characteristics of the practitioners produced. Add to this the realization that students who are in medical school and residency training from 1990 to 2000 will likely be practicing until the year 2040, and any such speculation becomes enormously risky. However, many of the current medical and health care changes are sufficiently likely to continue having a significant impact in the future that some generalizations can be advanced that may be useful in stimulating discussion and debate—even if they do not prove to be ultimately accurate in themselves.

Scientific preparation

The natural sciences of biology, chemistry, physics, and mathematics and the scientific method have traditionally been the fundamental underpinning of medical education. The existing and promising new developments in clinical medicine, such as transplantation, genetic engineering, laser surgery, advanced diagnostic technologies, new drugs, computerized screening and medical decision analysis, require that students preparing for medical practice understand the principles underlying these procedures so their applicability and limitations can be assessed. As much as we may wish it to be untrue, the day of the complete physician with a full range of knowledge and skill across the breadth of medicine is probably gone. How much specific basic knowledge about each procedure every physician needs to know must be clearly assessed. As medicine grows more specialized and complex, it becomes increasingly difficult for any individual to know more than a fraction of the technical information in any area. It may be that the principles of science underlying medicine should be learned by all medical students in college and the early years of medical school but that much of the detailed basic science should be left to more intense scientific education in the residency training years when a specialty has been selected and the basic sciences most relevant to that field can be mastered. The inherent risk of producing specialists with scientific expertise in only their respective fields can be limited by thorough grounding in principles, by teaching concepts that link specialties, and by teaching and evaluating methods of lifelong learning and adult continuing education.

Social foundations

As important as scientific knowledge and principles is an understanding of the social determinants of health and disease and how medicine and health care fit into the lives of individuals, families, and society as a whole. Because these areas have received minimal attention in most schools and because the social complexities of health and medicine are rapidly expanding, much more development and emphasis in this aspect of medical education will be required. As with the natural sciences, the principles of sociology, philosophy, psychology, economics, and law must be acquired in premedical education. Continued emphasis on a broad liberal preparation for medical school and a discouragement of narrow scientific preparation must become the rule rather than the exception. Such background is essential for an understanding of the psychosocial nature of illness and health, of the doctor-patient relationship, and of many ethical and legal issues that are increasingly involved in the care of an individual patient.

In addition, the importance of society as a whole in the etiology of disease and in improving the health status of the entire population will be much more important in future generations. The likelihood that as much improvement in health may come from alterations in personal lifestyle or from social or political changes as from advances in science makes such background essential. The shrinking nature of the world will also require American medicine to be ready to respond with cross-cultural understanding to the moral and political imperative that a basic level of health care be available to each human being regardless of circumstance. Physicians must have adequate educational preparation to discharge fully their responsibilities in their communities or in society as a whole. A prime example is today's physician who continually points out the medical consequences of nuclear war.

Humanistic medical practice

The public is expressing dissatisfaction with an apparent decline of humanism or interpersonal rapport in the doctor-patient relationship; some say this phenomenon is responsible for the rise in malpractice suits. Much of this is due to the specialized nature of medicine and the complexity and cost of the health care enterprise. It is common to hear the statement, "If I have to choose between competence and compassion, I'll take competence." But others question whether this is a choice that must be made. In *Megatrends*, John Nesbitt talks about "high tech/high touch," the need to "balance the material wonders of technology with the spiritual demands of our human nature."

Obviously this balance is not as necessary in those specialties with limited patient contact as it is in others, like psychiatry and primary care, in which quality care requires it. How can humanism be reemphasized in health care and in our physicians? There is no question that some aspects can be taught. Formal attention to the nature of the physician-patient relationship, communication skills, and ethics must be given much higher priority in the curriculum of the future. The process of medical education itself has dehumanizing characteristics which should be more clearly understood and eliminated.

There is a growing, though still minority, viewpoint in academic medicine that the admissions process itself needs to be reexamined. Individuals selected for medical education still predominantly reflect scientific rather than humanistic interests or tendencies. It may be necessary to select deliberately a percentage of individuals of adequate scientific ability who are predominantly humanistic in orientation, such as those who traditionally enter nursing or teaching. While methods for making such assessments fairly are not adequately developed, they are certainly possible. Including public members on admission committees is one radical possibility that might be experimented with. Admissions processes and financial aid must encourage minorities and low- and average-income individuals so the profession includes members who naturally understand the sociocultural status of patients from similar backgrounds.

Even the most humanistic physician must rely on other professionals such as nurses, social workers, and pharmacists for the many essential aspects of health care. At the least, physicians must be taught the roles and competencies of other professionals, and how to work with them effectively in the patient's interest. If an adequate humanistic component cannot be developed in our future physicians, we may need to consider a reduced number of physicians for more narrow technical roles and an expanded number of nurses and social workers for the more psychosocial aspects of patient care.

Medical education

The process of education itself must also be examined to discover more effective methods for producing the kinds of physicians that society will require in the future. Reduced use of lectures and rote memorization could be coupled with more laboratory work, small group sessions, and independent learning. Clinical settings other than university hospitals should be developed, both to broaden exposure and to recognize the highly specialized roles that these institutions play. More basic scientific concepts could be shifted to the residency years where they are required for selected specialities. Information process skills should be emphasized at all levels of medical education.

We understand that many of these suggestions are time-consuming and expensive to implement, but new methods must be developed and faculties expanded to achieve the desired ends.

Professional expectations

The world of professional practice in the twenty-first century, which students we are now training will enter, will certainly be different than the one we know today. In addition to new technologies, computerized diagnosis and therapy, and increased specialization, the structure of medical practice will force tomorrow's physician to confront less professional autonomy in making clinical decisions, more influence from large corporations, group rather than individual practice, the likelihood of some form of national health insurance, and reduced incomes. These potential changes can be confusing and demoralizing to students of medicine. They could, in fact, cause a change in attitude toward the practice of medicine which, in turn, could lead to medical schools attracting a lower quality student applicant and a deterioration of the professional responsibility physicians have assumed over the centuries.

It is the responsibility of medical educators to interpret such changes for students as clearly as possible to minimize the confusion or disillusionment that may result if traditional practice expectations are carried into the future. Most important, it is during the educational process that future practitioners must be assisted in finding ways to preserve the important traditional values, responsibilities, and rewards of practice while effectively integrating those values with the new technologies and modes of health care delivery.☐

Continuing Medical Education In The Late Twentieth Century

By Thomas C. Meyer and Richard H. Hansen
University of Wisconsin-Madison

Continuing medical education (CME) is the fourth and longest segment in the continuum of medical education. It follows the formal, tangible elements of undergraduate, graduate, and postgraduate medical education and serves physicians from the end of their organized education until they retire from practice. This continuum comprises three or four years of undergraduate education, four years in medical school, and three to five years in specialty training followed by decades of personal learning, which is an integral part of the physician's life.

During the early decades of this century the four-year medical school curricula adequately covered a well-circumscribed, well-accepted body of knowledge and taught the limited skills then available. The schools could award the M.D. degree with confidence, and the graduates could enter practice with assurance. CME had the comfortable role of reinforcing, updating, expanding the scientific base and introducing new knowledge and skills to the practicing physician. The changes were slow and not usually significant enough to affect materially the care that patients received.

Profound changes in medical science started to occur shortly before World War II and have shown an exponential increase since then. With this burgeoning of the scientific base the formal educational system responded by: (1) essentially doubling the length of time required to complete formal medical education, (2) continuing to train groups of physicians broadly based in medical science to deliver primary care, and (3) creating specialties and subspecialties by narrowing the breadth of knowledge as the depth of knowledge increased.

Those responsible for the formal education and training of physicians still relate to identifiable, manageable groups of students. Medical students will number fewer than 200 per class at a given school and are mastering a broad but clearly defined curriculum. Physicians in residency training also have clearly defined curricula and study in groups sufficiently small to receive tutorial training. In continuing medical education physicians number in the thousands and are divided among eighty specialties and subspecialties. While one part of the CME system must continue to meet the educational needs of family physicians, other parts of CME must address the varied and differing needs of physicians whose interests lie in such diverse fields as aerospace medicine, transplant immunology, and developmental disabilities. Continuing medical education has, therefore, become increasingly complex.

Fortunately, the process of medical education provides a sound base to begin to meet both traditional and new CME responsibilities. Throughout the process the individual is constantly reminded that a career in medicine requires a commitment to lifelong learning. There are varied and vast resources to meet that commitment.

Understandably, practicing physicians tend to use those educational methods and materials that are readily available and in the most convenient form. The cornerstone of most physicians' CME program is reading texts and journals. With more than 10,000 scientific journals available, any one of which may contain information of value in medical practice, most physicians have identified three or four journals which are most likely to contain the information they require. Another frequent source of information is colleagues, obtained either through formal consultation or "curbstone" consultations in the hospital hallway. Often overlooked is the fact that physicians learn daily from their patients and the problems they present.

For those who prefer more structured education there are conferences, workshops, and seminars presented by hospitals, professional associations, and universities. Audiovisuals play a minor, but increasing, role with a variety of films, audiocassettes, and videocassettes available. Fellowships of one to two weeks duration are available for the physician who wishes to return to the academic setting for general updating or to acquire a new skill.

While difficult to document, those involved in CME—both the educators and physician students—appear satisfied that the system is functioning adequately. The individual physician intuitively designs his or her continuing education and has a virtual smorgasbord of sources from which to obtain the required information. The major challenge continues to be the exposure of the profession to the means by which the human mind can cope rationally with the combined effects of the expanding range of alternative diagnoses, variety of diagnostic tests, harmful effects of increasingly potent drugs and at the same time respond to the rising demand to reduce costs of health care.

An educational tool, the microcomputer, shows promise as an extender of human memory and is just starting to be applied in CME. With a personal computer and a modem to gain access to telephone lines, the physician can tap a variety of data banks. The American Medical Association and General Telephone and Electronics have joined forces to create AMA/NET which has separate data banks on medical procedures, drug information, disease information, and socioeconomic information. Specialized services are being created, such as EPILEPSYLINE and BIOETHICSLINE.

The most promising possibility for the application of these small but increasingly sophisticated computers lies in the merging of the business and educational aspects of medicine in one source. Thus it is possible to develop a single data base containing information upon which to design objectively personal CME programs, in addition to information relating to the management of the physician's practice. The task of CME will be to introduce the technology of computer-based medicine in an acceptable, nonthreatening manner to a profession that is inherently suspicious of that which it does not fully understand.

Continuing medical education has traditionally been reactive, rather than innovative, in responding to change. The responses at the medical school and residency training level usually dictate the eventual response in CME. The time seems ripe for CME to take a more assertive role to influence the formal education process. The students and residents need to be comfortable with the use of computers in medical practice and the manipulation of the data in order to profile their own practices. At the end of their formal training, physicians should be able to design personal continuing education plans related to their own unique practice needs and their own personal learning styles.

Societal changes have also started to have an impact on CME in unanticipated ways. The better informed "patient," whose previous role in health care was to follow the doctor's instructions, has become a "consumer" and has assumed an increased role in his or her health care. This has required the physician to revert to the role of doctor (*docere* to teach) so that the consumer is fully aware of the possibilities and complications of the various options available for the management of the malady. Furthermore, when results are less than anticipated, the more litigious patient may ask the courts to decide whether malpractice had occured. In 1974 malpractice awards increased in frequency and amount, and insurance companies withdrew from the field. State government was asked to resolve the problem. Tacked on to the enabling legislation, almost unnoticed, was a requirement for mandatory CME. In order to renew his or her license, each physician, in sixteen states including Wisconsin, is now required to certify that a certain number of hours of continuing education has been completed and to be prepared to undergo an audit if requested.

A system to define quality CME and award appropriate credit had been voluntarily put in place a decade earlier, so implementing the mandatory CME requirement did not prove troublesome. However, it did cause CME providers to begin to question the relationship between continuing education, physician competence, and improved patient care. Much CME research in the past decade has been directed at defining competence, identifying those components that can be objectively measured, and evaluating quality of care. Documentation in the literature is still sparse, and the validity of CME is still essentially based on the assumption that quality continuing education, relevant to a physician's needs, will usually result in change of behavior and improvement in delivery of care.

With this unfinished agenda from the 1970s, it is with some anxiety that we in CME await the developments of the 1980s. Each major issue, many of which are discussed elsewhere in this journal, is expected to have some impact on CME. In its traditional role, it can deal with rapid advances in such fields of medicine oncology, transplantation, and genetics. However, its role is still undefined in economics (cost-containment and new payment mechanisms), structure of the health care system (health maintenance organizations and preferred provider organizations), formal education (projected oversupply of physicians by the end of the decade), and the substantive ethical issues that are evolving.

What, then, should CME seek from the formal medical education structure in the way of graduates? It is suggested that in addition to the requisite knowledge and skills to perform in their specialities, graduates of the formal education structure should be consciously aware of and comfortable with their own unqiue learning styles. In addition they should be able to use both objective and subjective means to determine their own learning needs in order to fulfill competently the demands of the consumers of their services. ☐

Nursing and Nursing Education Today

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The common stereotype of the nurse as someone who worked only in hospitals was never true, but with the development of new roles in nursing, it is now even less so. Increasing attention to health at home, at school, and in the work place has markedly changed the role of the nurse. The complexities of modern practice demand different educational preparation for nurses than was true only a few years ago.

Facts About Nursing, a statistical analysis published by the American Nurses' Association, shows that for the past twenty years, about 65 percent of registered nurses has been employed by hospitals. The next largest group (8 percent) is employed by nursing homes, nearly 7 percent work in community health, 6 percent in physicians' offices and clinics, 4 percent each in nursing education and as school nurses, and 2 percent in occupational health.

A marked increase in nurses employed by home care agencies is predicted. There are now over 7,000 such agencies in this country, more than the number of hospitals. With the implementation of diagnostic-related groups (DRGs) for medicare patients and the likelihood of shorter hospital stays, we can expect a dramatic increase in both the number of home care agencies and the number of nurses they employ. Patients will be returning home less able to care for themselves, requiring more support services and increased nursing care.

The critical shortage of nurses following World War II until the 1980s has abated. Nationwide, there was an 18 percent increase in the aggregate number of registered nurses between 1977 and 1980, and Figure 1 shows a steady increase in registered nurses since 1950. Although shortages persist in some regions, particularly less populated areas, and for some types of nursing practice, present trends suggest that the critical shortages of the past will be less likely in the future.

Changes affecting nursing

Affecting nursing practice and nursing education are changes in general education and an increasing level of education of the public; economic fluctuations and overall increasing affluence of the population; health insurance, enabling more persons to receive hospital care; the rising cost of hospitalization. Also significant are alterations in demographic patterns, particularly the increasing proportion of the elderly to the general population with the associated increase in chronic illness.

Not surprisingly, the women's movement has had an impact on a profession comprised primarily of women. (Nationwide over 97 percent of nurses are women, in spite of substantial efforts to recruit men.) When the first schools of nursing were established in this country in 1873 (1888 in Wisconsin), nursing and teaching were the only occupations open to respectable women. Probably many women entered nursing primarily because they did not want to be teachers. Today those who choose nursing have many other career opportunities now open to them.

Before World War II nursing was viewed less as a career than as a good preparation for marriage, and nurses practiced their profession only until they married. Today's graduate expects to combine marriage and a career, and this commitment has led to increasing professionalization. Nurses have sought additional education and joined professional associations to improve their practice; they share their ideas and research results in the professional literature; they search for better ways of providing better care to the clients they serve.

Fig. 1. Ratio of Employed Nurses Per 100,000 Population

1950	—	249
1960	—	282
1970	—	356
1980	—	560 (or 470 Full-Time Equivalents)

Source: Facts About Nursing: 1972–1973; 1982–1983

The labor movement has also affected the nursing profession, although traditionally many nurses have been opposed to collective bargaining and other tools of organized labor. Hospitals were excluded from the provisions of the Taft-Hartley Act in 1947 because of effective lobbying by the American Hospital Association. This resulted in many years of unduly low salaries for nurses; subsequent attempts to correct inequities often appeared unreasonable to the public. But better educated and more articulate nurses would no longer tolerate the poor working conditions and injustices their predecessors had suffered, and they did the unthinkable—they went on strike to improve intolerable conditions. The recently settled dispute in Minneapolis involved the largest number of nurses ever to go on strike.

Strikes by nurses are rarely for salary increases alone. Bargaining usually includes issues directly related to patient care, such as sufficient staffing by appropriate personnel, adequate coverage of patient units to assure quality care, and nurses' involvement in decisions affecting care.

Social and economic factors have always had an impact on nursing. At the same time, nurses have always been on the cutting edge of changes in health care. Public health nursing began long before the turn of the century and included nursing care of persons in their own homes, as well as preventive programs (well-baby clinics, immunization clinics, early detection and screening programs). Although under the general direction of a physician, these nurses often made decisions about the treatment of those under their care.

Historically, public health nurses cared for the poor and neglected. Without the public health nurse—now usually called the community health nurse—these people would have received little or no care. Though untrained, a woman, Dorothea Dix, brought the attention of the public to the problems of the mentally ill and radically changed their care. A nurse, Margaret Sanger, promoted birth control for the poor and illiterate and went to jail several times for her efforts. A nurse, Lillian Wald, founded New York's Henry Street Settlement and established a precedent for other cities in public health nursing services.

The pattern of nurses' concern for underserved populations remains today. It is nurses who have been concerned over the quality of care patients received in nursing homes. More often than not, nurses provide health care to jail and prison populations, to alcohol and drug abusers, to the developmentally disabled. Nurses hold the key to the success of the hospice movement—an approach to caring for the terminally ill and dying, frequently in their own homes.

Changes in nursing education

The first school of nursing was founded in 1860 at St. Thomas' Hospital in London. At the time, women were not educated outside the home, and the protective environment of the hospital, with housing facilities for students, was deemed necessary. In this country, a similar pattern evolved. Sometimes incorrectly called apprenticeship training, student nurses learned by doing, often with minimal supervision and very little instruction, rather than in a one-to-one relationship with a knowledgeable nurse. Most schools of nursing did not employ a nurse instructor until the 1920s. Prior to that, all instruction had been done by the superintendent of nurses, who also managed the hospital, and a few reluctant physicians.

Not until 1909 did the first college nursing program appear at the University of Minnesota. Fifteen years later, the University of Wisconsin established the first college nursing program in this state. Students who completed these early programs received a certificate in nursing and often did not complete requirements for a degree, although they were enrolled in regular college classes, particularly in the sciences. The first degrees required students to complete a double major, in nursing and another academic area, such as sociology or psychology. Nursing did not attain academic respectability until many years after the program was established.

Since college education for nurses was not generally expected, often not even by nurses and certainly not by physicians, there was no rapid increase in the college nursing programs until the trend for more education for everyone became more pronounced.

Another significant impact on nursing education was the G.I. Bill of Rights. Nearly half of the nation's registered nurses served in the military during World War II, and many used the G.I. Bill to complete college degrees. Since then, increasing numbers of nurses have received baccalaureate and advanced degrees. Federal support through the Health Amendments Acts of 1956 and subsequent legislation enabled many nurses to enroll in college; others worked while attending school.

The trend toward moving nursing education into the mainstream of general education was augmented by further developments in the community college movement. With the rapid growth of the two-year community college came a marked increase in associate degree programs in nursing (ADN). Begun in 1952 as experimental programs on the east coast, the expansion of these nursing programs has been phenomenal (Figure 2).

The increase in ADN programs led to the decline of hospital diploma schools of nursing, although the gradual increase in collegiate schools was also a factor. Pressures to improve all schools of nursing led to accreditation of schools by both state licensing agencies and national professional associations. Accreditation requirements meant more and better prepared faculty, more carefully designed curricula, more appropriate clinical experience with less use of students to provide nursing service. These developments often led to increasing costs to hospitals which offered nursing programs, another factor in closing three-year hospital schools of nursing.

Fig. 2. Nursing Programs and Graduations

	Number of Graduations	Number of Programs
Totals		
1974–1975	74,536	932
1980–1981	74,890	995
Diploma		
1974–1975	21,673	409
1980–1981	12,903	295
ADN		
1974–1975	32,622	268
1980–1981	37,183	375
BSN		
1974–1975	20,241	255
1980–1981	24,804	325

Source: Facts About Nursing, 1982–1983

Practical nurse programs were established in the 1940s to meet the exigencies of World War II, particularly in civilian hospitals. Most of these one-year programs are now in the vocational educational system. Practical nurses have such a limited role in acute care that many acute care hospitals no longer employ them. With continued increases of registered nurses and increasing demands for highly skilled nurses, we expect practical nursing programs to decline in the next few years.

When the Wisconsin Statewide Study of Nursing and Nursing Education in 1980 recommended two levels of nursing (two year and four year), many completion programs were established to permit practical nurses to complete the requirements for the ADN in less than two years.

Graduate education in nursing

Advanced academic degrees have existed for almost seventy-five years for nurses. However, until recently the master's degree tended to be the terminal degree. Early master's programs prepared nurses for administration or teaching with little or no emphasis on clinical practice. Some nurses sought doctorates in fields such as education as early as the 1920s, but doctoral programs in university schools of nursing are a recent development. Only two such programs existed before the 1960s, both closely associated with schools of education.

Welcoming the public health nurse (1950).

During the 1950s and early 1960s, the focus shifted from the managerial/educational to clinical nursing. Nursing leaders, such as the late Florence G. Blake, emeritus professor of nursing at UW-Madison, were writing about patient care from a perspective not previously addressed. The emphasis was changed from medical diagnosis, treatment, and related nursing care to clinical concepts such as adaptation, coping, stress, and the therapeutic use of interpersonal interactions. The study of clinical practice issues arising from the response of patients to illness and hospitalization increased. Systematic study of selected aspects of nursing care began appearing in the literature, and the first edition of *Nursing Research* was issued in 1952 under the editorship of the late Helen L. Bunge, dean of the school of nursing, UW-Madison from 1959 to 1969.

The demand for nurses with master's in clinical practice and doctorates with research skills has increased enormously. The recent report of the Commission on Nursing of the Institute of Medicine (1983) noted approximately 55,000 nurses with master's degrees. The projected need is for twice that number by 1990. Doctoral programs in nursing have increased from sixteen in 1971 to twenty-four in 1982. Nurses with Ph.D.s must be increased by 1,800 by 1990 to meet the demands for teachers prepared for the full range of scholarly activities expected by university faculty members.

In addition to the efforts of the profession itself, federal support has encouraged nurse faculty research development. The National Research Council's Committee to Study National Needs for Biomedical and Behavioral Research Personnel defined nursing:

> Nursing research focuses on the role of nursing care in the prevention of illness, care of the sick, and promotion and restoration of health. Although it relies upon and utilizes the substantive scientific information and methodology provided by the other biological and behavioral sciences, it differs from those other scientific areas in that it focuses on their relevance to nursing rather than other aspects of health care. (National Research Council, 1977, p. 152.)

Two doctoral programs in nursing in the University of Wisconsin System were approved by the Board of Regents in the spring of 1984. Faculty engage in both research and teaching, reflecting the national trend. The school of nursing successfully competed for $1,073,047 of outside funding last year. The school was one of six in the country which received enough Public Health Service research grants in 1982 to meet eligibility requirements for a Biomedical Research support Grant. Research conducted by the faculty reflects some current health concerns: the psychosocial consequences of adolescent motherhood; family coping patterns in high risk and low risk pregnancies; factors related to endotracheal suctioning and airway care; health and mental status in older people after relocation; ways to decrease confusion in hospitalized older people; children's knowledge of health and their care of self.

Continuing education

Nurses were responsible for setting up the first continuing education nursing department in a university in 1955 at the (then) Extension Division of the University of Wisconsin. The program was expanded to reach nurses across the state. The Wisconsin approach, designed by Professor Emeritus Signe Skott Cooper, served as a model for such programs around the country, which were often supported by federal funds. Although Wisconsin does not require continuing education to relicense nurses, the Wisconsin Nurses' Association supports voluntary continuing education.

Nurses expand scope

With the emphasis of graduate education shifting to advanced clinical nursing came concern by the profession about its role and responsibilities in providing health care. In the late 1960s two role inovations developed: the clinical nurse specialist (CNS) and the nurse practitioner (NP). The needs of hospital patients influenced the role of clinical nurse specialist. The UW-Madison School of Nursing was one of the first to establish joint positions between the school and the nursing service at University Hospitals. The role, function, and education of the CNS focused on differentiating the nurse's contribution to patient care from the doctor's. A CNS requires graduate specialization with in-depth knowledge of the health problems of a given population.

The role of the NP, on the other hand, was influenced by forces outside the nursing profession. The NP was initially conceived as a community health nurse with graduate training, who could incorporate such skills as health history and physical examinations previously done by the doctor and could provide primary care to certain groups. However, the physician shortage profoundly influenced subsequent events. The idea that nurses could provide certain aspects of medical care "caught on." As a result, the education as well as the use of the NP developed unsystematically. Short-term and continuing education programs developed without standards or guidelines. In 1971 the HEW Secretary's Committee to Study Extended Roles for Nurses published its report describing functions for which nurses were responsible, those which they shared with physicians, and those medical functions for which they could be prepared. The report recommended financial support to prepare over one million nurses for this extended role, a response to the perceived physician shortage.

The nursing profession was devided on whether the extended fole functions constituted nursing. The January, 1972, *Nursing Outlook* editorial sums up the issues: If the purpose of an enlarged nursing role is simply to extend the physician's primarily therapeutic and illness-oriented services, then nothing has changed. But if the nurse provides a different kind of health care service, then we have the potential to restructure the health care delivery system.

Nevertheless available federal funding brought about a proliferation of NP preparation programs, mostly outside the mainstream of nursing education. Except for in a few pioneering graduate programs such as the UW-Madison, nurse educators had little influence on the curriculum development. Eventually the public acceptance of the NP and the availability of federal monies stimulated the development of NP programs within colleges.

Inherent in the NP movement was the assumption that existing methods of providing primary care were adequate in quality. The problem was quantity. There is no physician shortage today; a surplus of 70,000 doctors by 1990 is projected by the Graduate Medical Education National Advisory Committee. Its report in 1980 specifies that as the number of physicians increases, the need for other health providers such as the nurse practitioner will decrease. The report does note the need to identify aspects of care offered by health providers other than physicians which add to the quality of health services.

Nurses play an increasingly important role in delivering health care services to people regardless of their location. The nurse now functions within the context of both the medical and the nursing model. In some instances such as in nursing homes, nurses are the primary providers of clinical care with physicians as consultants. This fact was recognized by the Robert Wood Johnson Foundation's initiative to fund the national development of teaching nursing homes under the direction of eleven schools of nursing, including UW-Madison, with the objective of influencing the standards of care in nursing homes.

Providing family services by the nurse practitioner (1980).

Although the public tends to see nurses as primarily carrying out doctors' orders and providing basic personal services during acute illness and hospitalization, new knowledge in medicine and nursing should significantly alter this view. The American Nurses' Association *Social Policy Statement* (1980) defines nursing as the "diagnosis and treatment of human responses to actual or potential health problems." Nursing is concerned with a wide range of health-related responses which may be observed in both sick and well persons. Nurses attend to the dynamics of health care needs not specifically addressed by doctors. Nursing emphasizes functions which are distinct from but complementary to the practice of medicine, which potentially make a significant impact on the quality of health care services.

This review of nursing and nursing education has described some remarkable changes in a profession with a relatively short history. Nursing's development has been influenced by educational, economic, political, and social trends, but even with major changes and turmoil within the profession, it has always been responsive to the needs of the society it serves. ☐

First four-year medical class, University of Wisconsin, 1927. (Courtesy of U W Medical School)

Medical School Remembered

Women's Experiences at the University of Wisconsin

By Rima D. Apple and
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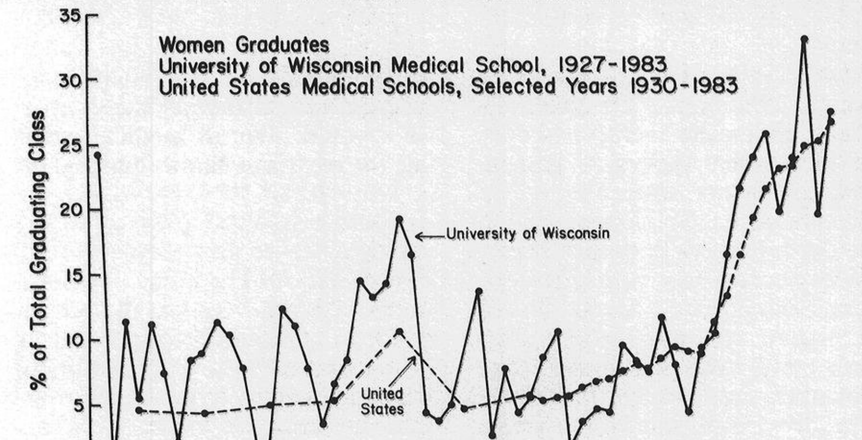
"The University of Wisconsin was very much ahead of most medical schools in their admission, support, and treatment of women," (1916) recollects one physician who attended medical school in the early twentieth century. Another woman remembered that during her student years in the 1910s she felt like "a member of one large family." (Arnold) Such memories and quantitative measures, too, suggest that women have fared well at the University of Wisconsin medical school. When the school opened its doors with a two-year preclinical program in 1907, three women matriculated in a class of twenty-six. In 1927 at the graduation of the first four-year medical class the school conferred medical degrees on six women and nineteen men. More recently, in 1983 forty women and 107 men received medical degrees. Though these figures give the impression that the medical school has changed little in its acceptance of women, study of the intervening years presents a significantly different picture.

Twenty-four percent of the first graduating class was female. For 1927 this percentage is particularly striking because in the early decades of the twentieth century some coeducational medical schools had established quotas for women of approximately 5 percent, and nationally women constituted only about 4.5 percent of graduating classes. After UW's first four-year class, however, the proportion of women graduates dropped precipitously. In 1928 no women graduated; in 1929, five in a class of forty-four; in 1930, two in a class of thirty-eight. Graphically illustrated in Figure 1, the percentage of women graduates varied significantly over



the next several decades. From a low of 1.9 percent in 1940, women did not once again attain levels much above 10 percent until the war years. During th 1950s and 1960s the numbers of women students decreased but continued to fluctuate widely. Only in the late 1970s did the percentage of women medical graduates rise to the height of the 1927 class, and with some modulation it has remained relatively high.

Any explanation of this uneven pattern must consider several factors. How many women applied in any given year? How many of these were accepted? How many accepted students enrolled? Answers to these questions help us to understand the shifting position of women students in the medical school.

In 1926 ten women applied to the University of Wisconsin Medical School. The numbers of applicants remained relatively small until the early 1970s. In 1974 the school received 148 applications from women, a more than fourteen-fold increase, and by 1983 applications from women had increased to 153. In contrast, male applicants to the University of Wisconsin Medical School barely doubled between 1926 and 1974, from 247 to 549, but have since decreased to 283 in 1983. (See Table 1.) The UW accepted a relatively high proportion of women, especially in the early years. In 1926 of the ten women applicants, eight were accepted (80 percent). In 1927 sixteen women applied and ten were accepted (62 percent). By the 1970s and 1980s, however, the figures are generally not as high; on the average, 44 percent of women applicants gained admission (40 percent of men).

TABLE 1
Applicants and Acceptances*
University of Wisconsin Medical School

	Applicants		Acceptances		Percent Accepted	
Year	*Female*	*Male*	*Female*	*Male*	*Female*	*Male*
1970	30	324	16	143	53.3	44.1
1971	49	371	25	144	51	38.8
1972	96	390	32	135	33.3	34.6
1973	121	481	56	169	46.3	35.1
1974	148	549	55	156	37.2	28.4
1975	140	489	48	149	34.2	30.5
1976	147	465	50	136	34	29.2
1977	103	435	73	149	71	34
1978	111	328	50	196	45	59.8
1979	137	320	54	158	39.4	49
1980	144	324	70	142	48.6	43.8
1981	154	335	69	143	44.8	42.7
1982	158	328	69	148	43.7	45.1
1983	153	283	59	144	38.6	50.9

*Numbers include Wisconsin residents only because since 1970 only a limited number of non-residents are admitted to the medical school.

Admissions committees traditionally questioned women's commitment to medicine. Charles Bardeen, dean from 1907 to 1935, supported the idea of women physicians, but frequently found it difficult to apply that support to individuals. He once told a woman applicant that "women in medicine never go on to use it," and furthermore, "the state couldn't afford to train them if they weren't going to use their medicine because there were good men who wanted to go into it." (1929) On a more personal level, Bardeen counseled one of his daughters away from medical school and into nursing. Another daughter did attend medical school, several years after her father's death. William Middleton, dean from 1935 to 1955, surveyed the first thirty-three women graduates to assess their dedication to medicine. He learned that ten of them married, four had children, and two were "homemakers rather than practitioners of medicine." He "repeatedly emphasized that he wanted only female students who would serve humanity [with] their medical training. He did *not* want those who would give up medical practice for marriage, family-raising, or other careers." (1943)

Though the class size grew from ninety entering students in 1957 to 159 in 1976, the increase did not match the growth rate of applications. In the last decade, applications have declined somewhat, and the state legislature has determined that the class size will also shrink. The current enrollment of 159 will in 1984 become 155, and the class size will continue to decrease until 1987 when it will be fixed at 143. Competition for the limited number of places is keen. Not surprisingly, then, admission procedures have become more rigorous.

Worries about women's dedication to medicine continue to plague the admission committee at UW. Women graduates from the 1960s and 1970s complained that interviews were often "required of all women—optional for men." (1974) Admission committee members would ask women applicants if they "planned to get married and would that cause [them] to drop out' (1966) or "about boyfriends, marriage plans, making [them] feel as though [they] should have taken an oath of celibacy." (1971) At least one female applicant's husband also was interviewed, apparently to forewarn him what to expect if his wife were admitted. (1974) Although studies have shown that female physicians do not "drop out" of medical practice to a greater degree than male physicians, the belief that they are a higher risk group persists.

Women students in the 1920s, 1930s, and 1940s expected a certain amount of suspicion about their presence in medical school, and they did not resent the implication that they were not serious students. As one of them explained: "Really I have very little bitterness. Perhaps I *expected* to have a harder time of it than the men, and I took a certain amount of hostility in stride, ignoring it as much as possible." (1929) In contrast, students in the 1960s and 1970s resented questions about their personal lives and considered that treatment discriminatory.

Since the late 1970s, changes in the selection procedure have somewhat mitigated the potentially discriminatory aspects of the interviewing process. Currently, members of the admissions committee rank all applications and interview every applicant whom they expect to accept or to place on the waiting list. The committee uses the interview as a recruitment tool to inform prospective students about the school. In contrast with other medical schools, the UW conducts interviews that are "laid back," that "didn't ask any screening questions," but rather said "let's sit down and chat about the school." (1986) Women now are pleasantly surprised that during interviews no one asks about their personal lives or questions their family situations.

Despite concerns over possible discriminatory admission procedures, the number of acceptances of women grew steadily from sixteen in 1970 to seventy-three in 1977 and, although fluctuating, has remained high. Moreover, Figure 2 illustrates the consistent increase in the proportion of women first-year medical students at UW since the early 1960s, percentages not reflected in national statistics until more recent years. High grade point averages and Medical College Admission Test scores of the applying women ensure that they are acceptable. Furthermore, federal affirmative action pressures have created an atmosphere that encourages more women to apply and encourages the acceptance of well-qualified applicants. Since the late 1970s, the number of women seeking admission to the medical school has continued to grow, while applications from men have fallen. (Table 1) At the same time, the acceptance rate for women has declined compared to that of men.

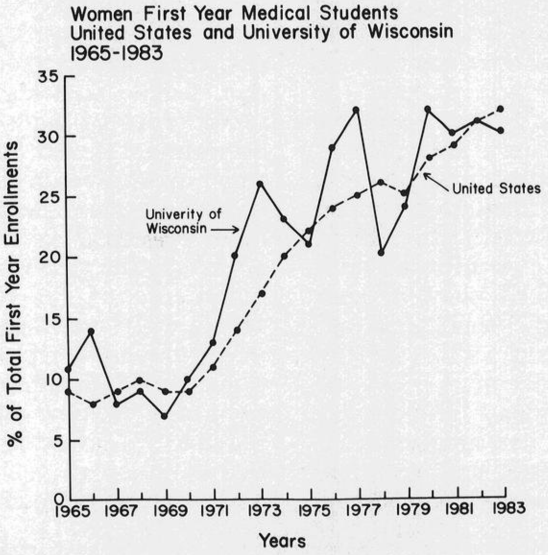
Once admitted to UW, women medical students have enjoyed more support than some of their colleagues elsewhere. A physician who graduated in 1947 thought that her "teachers were supportive and interested in me as a human as well as a woman." Women students remarked on the open atmosphere in which women "were taken as a matter of course" (1950) and "always had been treated as students and accepted as women who were trying to make the grade in a male-dominated profession." (Edelman) Of course students' perceptions varied greatly, and women who had similar experiences could disagree.

Since the revival of the feminist movement in the 1960s, graduates have been more sensitive to discrimination. Wisconsin did not allow women in the 1920s and 1930s to catheterize male patients or to rotate through the male urology clinics, but in those years the women students did not see these limitations as discriminatory. Faculty treated female students with more care and "courtesy" than male students, and the women did not scorn but appreciated the special attention. Over the recent years, women graduates have become more critical of their classroom experiences. Students repeatedly noticed the "derogatory women jokes" (1958), and the "general lack of sensitivity" (1974) to women's presence.

The ways students responded to slide-lectures clearly indicate changing attitudes. In the 1960s and 1970s, women were not infrequently presented with "lecture and slide sessions with overt sexual (always female) overtones by male lecturers." (1972) Though students may have been unhappy with these images, they felt that they could do little about them. As one professor informed his women students, "the slides were entertainment for the men" and "you're in a men's medical school, you have to be one of the boys." (1969) If such images are shown in a class today, students are more likely to "hiss" the lecturer and in at least one case circulated a letter, signed by both women and men students, objecting to the "inappropriate behavior." (1986)

One of the most publicized events occurred in 1973 when a UW pathology professor joked that a woman student could not make an announcement before class "because she's got too many clothes on." He continued:

> We have to give you equal rights and the first thing you know . . . women will dominate society. Thank God I'll be dead before you do though.



Women students filed a complaint with the Office of Civil Rights and organized around this blatant example of sexism, which was reported in the national press. The school took no formal action, although the professor finally apologized to the class. (Shapley)

Overt sexism is becoming less frequent, although female students still notice enough covert behavior to make them feel uncomfortable. Especially when their numbers were small, women found that they "never could be absent because this would be noticed." (1966) Several faculty had a "subtle leering, sneering attitude" toward women students (1972) and "took males more seriously." (1975) Other teachers showed "less willingness to allow a female student [to] assume responsibility—e.g., in operative techniques, active management." (1974) In a sense, sexism has gone "underground." (1976) Women students overheard "snide comments" and "many chauvinistic remarks." Graduates reported that some professors "always made sexist comments, a few gave women *more* attention." (1976) While earlier in the century women students may have valued special treatment, more recently they interpreted such notice as "paternalistic." (1976)

More subtle sexist practices have existed as well. Despite the long history of women at the UW medical school, the administration gave little thought to their sleeping facilities. Women on call in obstetrics and other services often found themselves billeted with the nurses and physically separated from their male counterparts. (1969) Physical separation affected their learning because informal conversation with professors and other students has been an important part of clinical education. The problem of space for women increased in the 1970s as more women were admitted. In Marshfield, where many students served their preceptorships, men lived in individual apartments and women in the nurses' dormitory where they were subject to strict regulations. Not until the late 1970s was more equitable housing arranged for women students at Marshfield.

Since the male medical fraternity excluded females, women students in the 1920s formed a local chapter of Alpha Epsilon Iota, the national medical sorority. For several decades AEI held frequent gatherings of students and faculty for mutual support. Through the 1950s "all active women of the medical school met at the Union" (1945), meetings which many women remember fondly. AEI disbanded in the mid-1950s when the national organization concluded that women were accepted in medicine and there was no longer a need for a separate women's organization. On the UW campus, however, women students continued to meet informally, not to exclude men from their friendships, but to find "closeness," "camaraderie," and support from a women's group. (1969)

Feeling the need for a formal structure, women students in the late 1970s organized Women in Medicine, which a short time later affiliated with the American Medical Women's Association. In Women in Medicine medical students meet with women faculty and community physicians to discuss women's health issues and problems of professional women. Though women comprise a significant proportion of each class, women students still prize the "camaraderie," mutual support, and role models found in women's organizations. (1986)

The fact that women have been relatively happy at the UW does not mean that the institution has always been sensitive to women's role in medicine. In the past preferential treatment, derogatory attitudes, and exclusion from some activities are evidence of discriminatory practices, even if the women themselves did not experience it as such at the time. More recently, on quantitative measures, women medical students appear to be doing well. Their numbers have increased; a relatively high proportion of applicants are accepted. Once admitted to the medical school, however, they sense some discrimination at a personal level. In lectures, in on-call facilities, and in daily interactions with their professors and fellow students, women experience some discomfort and do not feel totally accepted. Still, the majority of women students today undoubtedly will leave the UW remembering "a lot of caring people" (1969), and most will agree with the assessment of one member of the class of 1977:

> Despite how discouraging, even depressing [my remarks about my student days may seem], I remember the time as a fond and fun one—because of my personal growth, . . . friendship with other women medical students, Madison environment.

All in all, women graduates recall, the University of Wisconsin "medical school was a very enjoyable experience." (1957)

Notes on Sources

We are grateful to all the women who in interviews and through our questionnaire shared their experiences with us. To ensure their confidentiality, replies are quoted without names, identifying merely the year of graduation, except when quotations are taken from published sources. Statistics were gathered from the Admissions Committee of the University of Wisconsin Medical School, the Office of Statistics of the University of Wisconsin-Madison, the *Journal of the Association of American Medical Colleges*, and the *Journal of the American Medical Association.*

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The Marshfield Clinic

By G. Stanley Custer

Marshfield Clinic Archivist

Marshfield, a rural community of 18,500 people, is situated in the geometric center of Wisconsin. Here is located the Marshfield Clinic, a unique, successful, multi-million dollar medical clinic established in 1916, the first one in the state. The scientific energy for this successful enterprise derives from 205 physician specialists supported by twenty-two sophisticated Ph.D. service and social scientists. They employ over 1,200 persons. In 1983 470,000 patients were treated in the clinic; of these 19,200 were new patients.

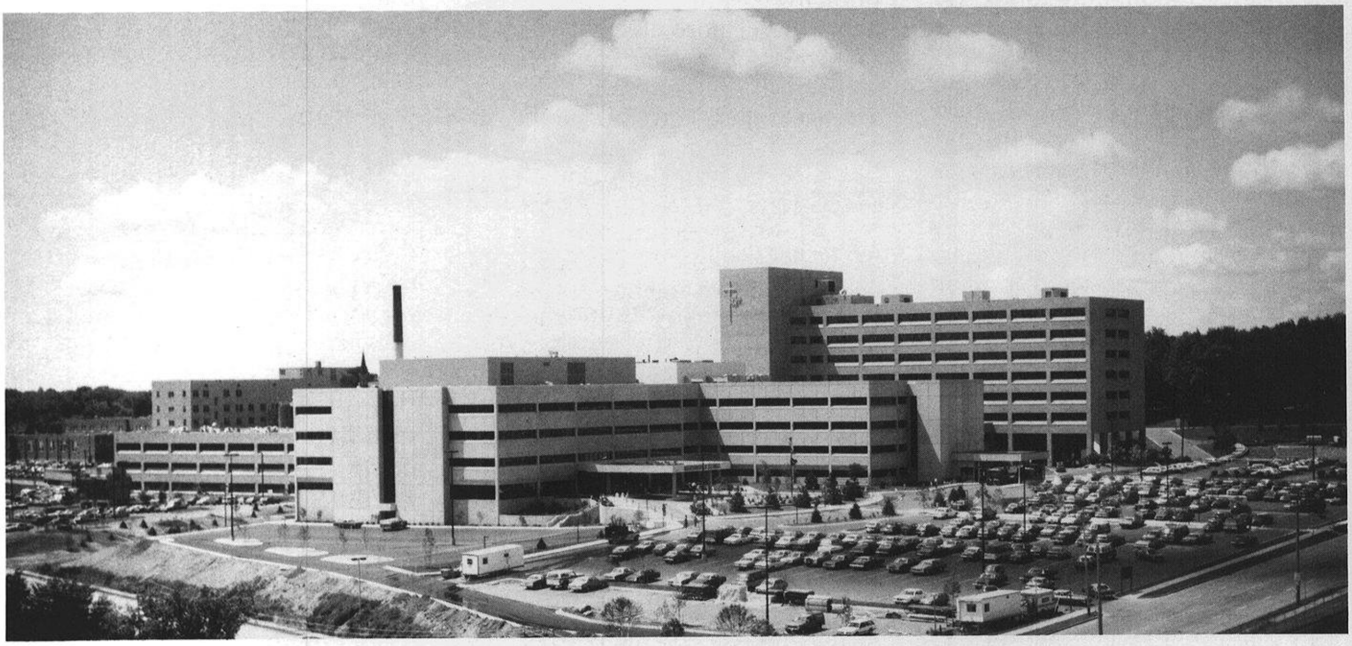
How did a medical clinic of this magnitude arise and thrive in these bucolic surroundings? How did it begin? What are the elements of its success?

In 1881 a German family named Doege immigrated to the United States with their fourteen-year-old son Karl because they were dissatisfied with the sociopolitical situation in Germany. They took their son to Milwaukee, the cultural and educational center for German immigrants in the United States at that time. They enrolled him in the German American Academy where he completed his education and became a teacher. Karl soon found, however, that his real interest was medicine. He enrolled in Western Reserve Medical School and in 1890 graduated top of his class. He opened an office in Marshfield, Wisconsin, a railroad center and roaring lumbering town not far from Thorp where his parents farmed.

The same year that Karl W. Doege came to Marshfield, the Sisters of the Sorrowful Mother, a small group of industrious Catholic nuns, had built a small hospital, St. Joseph's. They had difficulties making financial ends meet until they converted the hospital into a health spa. Water cures were popular in those days, and the sisters employed the Kneipp water cure with eminent success.

From the outset medicine was an intensely serious business with young Dr. Doege. The quackery of the health spa was anathema to his personal medical philosophy, and he made it known that it had no place in his medical plans for Marshfield. Being aggressive, resolute, and forceful in his convictions, he struck an agreement with the sisters. He would organize a medical staff for the medical care of the sick in the hospital if they would get out of the water cure business. They did.

After three years of practice Doege was dissatisfied with his medical knowledge. Listerian asepsis, improved anesthesia, and the development of the rubber glove permitted a wider application of surgery to cure human ills. Doege wanted to learn more. In spite of



Marshfield Clinic/St. Joseph's Hospital Medical Complex the demand for his services, he closed his office and returned to Germany to study for a year. This was the first of many such educational and teaching sojourns that he made to Europe, and occasionally to Johns Hopkins in Baltimore. Each time he returned to Marshfield to resume his practice.

The hospital and the citizens of the area were the beneficiaries of his serious, unremitting medical and surgical inquiry. He became so busy that he had to employ another physician to help do examinations and administer anesthetics. He was busy not only because of his skills but because Marshfield was the hub city, an easy town to get to. Each day there were forty-six arrivals and departures by train in the community.

By 1914 the three older doctors in the community had either died or retired, and five new physicians replaced them. H. H. Milbee, trained at Trinity College in Canada, opened an office. He encouraged Victor Mason, the son of his next door neighbor, to study medicine at Trinity College, too. Following graduation Mason studied in Edinburgh and London for a year and then returned home to practice. Walter Sexton, the adopted son of a Marshfield druggist, studied at the University of Wisconsin. Encouraged by Doege, he finished his medical and specialty education at Johns Hopkins and returned to work with Dr. Doege. Roy Potter graduated from Milwaukee Medical College before coming to Marshfield, and William Hipke, who had become an eye, ear, nose, and throat specialist in Vienna, came to Marshfield from Milwaukee where he had first set up practice.

About the middle of the year 1915, K. W. Doege invited these men to consider working together for a more scientific and efficient practice of medicine. Serious discussions continued frequently during the ensuing year and a half and culminated with an agreement among Drs. Doege, Mason, Milbee, Potter, Sexton, and Hipke that would combine all of their personnel, equipment, patients, and uncollected accounts into one business corporation. They moved into their new offices in the last week of December, 1916.

Public apprehension arose because of the development of the new clinic that the group would exploit the public by increased fees and, further, that personal preference would be lost. This prompted the founders to make a public expression of the philosophy upon which the Marshfield Clinic was founded: " . . . the purpose of the organization is not to form a so-called trust and charge bigger fees, nor to prevent the public from choosing the physician they wish to employ . . . The real aim of the organization is to give better and more efficient service to the public and to do it in a more scientific way in order to be able to compete with the medical centers in the larger cities. Each member of the firm, besides his usual work, will do reading and study in a special field. He will thus gain more expert knowledge, by reason of such study and will, through this extra knowledge, assist and help his colleagues in diagnosing especially difficult cases. In the course of time, we will all be better doctors and will give better service. We will be more efficient. That is all there is to it." This expression of purpose remains as dynamic a force today as it was on January 2, 1917, the day when the first patients were seen.

In the beginning a number of events were responsible for the Marshfield Clinic's growth to eminence on the medical scene. In 1915, Chapter 86 of Wisconsin statues provided that physicians could incorporate for the practice of medicine. The founders eschewed the single proprietary ownership arrangement and established instead a business corporation. The choice of the name Marshfield Clinic emphasized the importance of the group as a whole rather than any one of its individuals.

The founders of the corporation provided that each member could buy a single share of noninterest-bearing stock worth one thousand dollars. It offered membership on the board of directors of the corporation, which conferred one vote in the operational decisions of the clinic. The members of the corporation had to be physicians practicing in Wisconsin. They would be salaried stock holder-owners of the corporation, but they had no rights to the real property or equipment of the institution. Thus the articles of incorporation perpetually protected the clinic facility from the designs of any one of its members. All expenses were paid for by the clinic corporation, more clearly, by the doctors.


G. Stanley Custer

The first Marshfield Clinic started with excellent equipment, facilities, and an exemplary medical library. The first professional staff included K. W. Doege in thyroid and gastrointestinal surgery (general surgery); Victor Mason in orthopedic and neurosurgery; William Hipke in eye, ear, nose, and throat; Walter Sexton in urology and gynecologic surgery; H. H. Milbee in internal medicine; and Roy Potter in radiology. The founders of the Marshfield Clinic were as well trained for their days as clinic physicians were at any other time in history. They had prepared themselves with additional training, reading, and seminars. They established a habit of reporting their newer knowledge to each other and to doctors throughout the area and by publishing their own observations and experiences. They established an educational model, which has been built upon over the years and which has led to the development of teaching programs for graudate and undergraduate medical students, research, clinical and laboratory and administrative personnel. The insistence upon the quality of new physicians and their medical practice was nurtured by subsequent generations.

The Marshfield Clinic has been described by some as a socialistic organization. The property and equipment are owned by the corporation, the doctors are salaried, and, as in a marriage, a measure of sacrifice and compliance is required. Generous benefits, designed to reduce tensions and anxiety related to health and education include sick leave with pay, adequate vacation, life and health insurance, generous annual expenses for study without loss of pay including travel expenses, three month educational sabbatical every seven years, a one-time recreational sabbatical, and provision for retirement income for all.

A unique salary concept contributed to the clinic's tremendous growth. Originally, salaries were determined on the basis of seniority in the group rather than upon earnings or numbers of patients seen. Inequities developed within the group then even as they exist throughout the medical profession today. In the 1940s it became apparent that a core of doctors within the clinic, of widely divergent specialities, was receiving almost identical salaries. This set the stage for a program which called for equal salaries for all physicians. It became apparent that each member's specialty was as important to the whole practice as another's. It was agreed that a man chose his specialty because that area of medicine interested him, not the emoluments. The equal salary plan, which persisted until 1980, allowed the physician to concentrate on patient care and not on the dollar.

In the late 1940s the clinic began experimenting with health insurance programs, lessons which were helpful when in 1971 the Greater Marshfield Community Health Program was developed. This HMO provides all of the services of the Marshfield Clinic to over 65,000 participants in the central Wisconsin area. It is one of the oldest and most comprehensive programs ever developed in a primarily fee-for-service group practice. It is distinguished by utilizing community rating and open enrollment in which one can become a member regardless of health status without paying additional premiums. The plan helps the patient by permitting the use of other health insurance plans and services of physicians in the area who are not associated with the Marshfield Clinic.

In 1972 effort was directed toward joint venture laboratory to eliminate the cost of maintaining one laboratory in the hospital and another in the clinic. It required two years of negotiations to accomplish. The result was a more efficient clinical and pathology laboratory reducing duplication of personnel, equipment, and tests, thereby providing lower costs to the patient.

The clinic has grown to supply diversified and comprehensive outreach programs around the state. Six regional centers have been established in areas of need and by public demand. These are staffed by full-time clinic physicians and augmented by thirty physicians in fourteen specialities who serve the regional centers on site on a regular consultative basis. Other services are supplied to physicians, clinics, veterinarians, and hospitals in thirty-six counties and three states. These include heart and lung studies via telecommunications and a comprehensive and fully accredited reference laboratory which supplies same-day lab results. Accredited educational programs are available at home or at the Marshfield Clinic. Services for biomedical equipment, medical physics, prosthetics, quality assurance, general management, and administration are also available to the physician in his office.

The above emphasizes some achievements of the Marshfield Clinic. All activities of the clinic are supported by the corporate physical and economic strength of the doctors and their supporting staff. The progress of the clinic, its growth, development, and expansion are the result solely of decision making by the board of directors of the clinic provided for by the founders in 1916. At present there are 175 members on that board. Each physician member is eligible for election to the board if he chooses to become a stockholder. The board meets once a month in the evening. A nine-member executive committee composed of the officers of the clinic and five other elected members of the board advises the board. Final decisions for any program or for any major expenditure are made by this large board. Opinions held by members may be strong and debate often long and heated. Time required for decision making may be long, but the majority opinion prevails. Seldom, if ever, is an issue decided without all sides of the question being thoroughly addressed and elucidated with the assistance of the president and his administrative staff. The board of directors employs or rejects a physician, sets salaries, authorizes expansion of facilities and scientific endeavor, designs work programs and work schedules. Little in the life of the group is not decided by the member physicians of the clinic. While many students of corporate structure regard a board of 175 as ridiculous, others believe this "Town Hall" approach to resolving issues may be the best. Certainly, the one man, one vote procedure, which was handed down by the founders, is a legacy which no participating member has thus far been willing to relinquish. The right to have a vote in the growth and development of this organization is perhaps the single most important possession of the member physician. This democratic process has been largely responsible for the success of the Marshfield Clinic. Certain qualities of character—giving, taking, and sharing, cooperation, professional effort and competence, pride in all phases of the work—make up the spirit of the men who, over the years, built the Marshfield Clinic into what it is today. Their vision derives from the purposes set forth by the founders in 1916. ☐

The Marshfield Medical Foundation

By Richard D. Sautter
Executive Director

All organizations have their roots in the past and indeed in other organizations. The Marshfield Medical Foundation arose out of the needs of the Marshfield Clinic physicians to research and learn and teach. The earliest interest in organizing a research program was shown by Stephan Epstein, who came to the clinic from Breslau, Germany in 1935. With a meager fund of $400 provided by his clinic colleagues, he initiated dermatologic research in the 1940s, which for mostly economic reasons did not thrive. Undaunted, however, Dr. Epstein continued his own research and urged the establishment of a medical foundation. His efforts reached fruition in 1959 when the Marshfield Medical Foundation was incorporated to engage in medical and scientific research, education, and community service.

The Marshfield Medical Foundation received its first two grants from the National Institutes of Health in 1960. The first was for a study of farmer's lung—a debilitating and sometimes fatal disease of farm workers—research in occupational medicine continuing today. More than 10,000 farmers throughout the United States have benefited from that project. The second grant was for a study of the effects of sunlight on the skin of patients treated with sulfonamides, an interest of Stephan Epstein's for which he was internationally recognized. From this project many other studies in photosensitivity arose.

In 1962 the foundation received a substantial grant to study maple bark disease. In 1964 the Marshfield Medical Foundation began studies of the cardiovascular system. The Wisconsin Heart Association supported development of new techniques for open heart surgery. During this same period basic science and clinical research studies in hypertension were initiated.

By 1966 the foundation activities received support from fourteen different agencies. The Marshfield Medical Foundation and Marshfield Clinic cooperated with other major medical institutions in America to determine the effectiveness of drugs then being used in patients who had suffered a previous heart attack. The foundation's significant contribution to this seven-year study was instrumental in developing a system of care for heart attack victims at Marshfield.

The Marshfield Medical Foundation received a grant from the Wisconsin Regional Medical Program in 1967 to study pulmonary thromboembolism. Techniques developed from this research aid in the diagnosis and the treatment of that disease. These studies led to other grants from the National Heart, Lung, and Blood Institute to study urokinase to treat pulmonary thromboembolism and the origin of emboli in the deep veins of the lower extremities. More recently the foundation and clinic have been involved in a cooperative trial supported by the National Heart, Lung, and Blood Institute to study the outcome of coronary artery surgery and investigate prevention of myocardial infarction during open heart surgery. Marshfield Medical Foundation investigators have been leading contributors to these collaborative studies involving major medical institutions throughout the United States.

In recent years investigations of the gastrointestinal tract have included mass screening for cancer, basic investigations into the etiology of Crohn's disease, and studies on the effects of bran on gastrointestinal function.

The foregoing are examples of basic medical research and clinical research at the foundation. The development of the Greater Marshfield Community Health Plan, a prepaid health plan, provided impetus for socioeconomic or health systems research. This research investigates innovations of the prepaid health program and their impact on the health care delivery system. The health plan also provided the structure for prepaid financing of government-sponsored health programs. The first to be established was the Greater Marshfield Family Health Center sponsored by the U.S. Public Health Service, which has served over 15,000 low income enrollees ineligible for medicaid. The foundation and the Wisconsin Division of Health initiated prepaid medicaid contracting in Wisconsin with a grant from the United States Public Health Service. This program achieved 20 percent acceptance by the medicaid population and was later expanded through a freedom-of-choice waiver to include 95 percent of the eligible resident medicaid beneficiaries. The program was developed with the hypothesis that this delivery system could provide comprehensive health care for the indigent population at a reduced cost. A similar experiment was carried out for the medicare-eligible population as well, ultimately providing prepaid medicare services to 9,000 beneficiaries in parts or all of eight counties.

A fourth mission of the Marshfield Medical Foundation is community service. Besides the project outlined above, it includes the development of Maple Manor, Maple View, and Grandview Manor, halfway houses located in north central Wisconsin, which serve a broad population of psychiatrically disabled adults. The foundation has a significant responsibility in the development and administration of the Marshfield Comprehensive Child Care Center, which supplies services such as home teaching for children with disabilities, medical respite care for severely handicapped children, cleft lip and palate clinic, children's orthopedic clinic, scoliosis clinic, arthritis clinic, genetic and birth defects clinic, child/adolescent psychiatric unit, and perinatal center.

A final mission of the foundation is education. Here the foundation, the Marshfield Clinic, and St. Joseph's Hospital cooperate to provide educational programs for junior, senior, and resident housestaff, augmenting other formal educational programs in these institutions. In 1981 the Marshfield Clinic established the physicians' research fund, designed specifically for physicians with little or no previous research experience who wished to develop a research idea. This experience helps physicians to obtain extramural funding later.

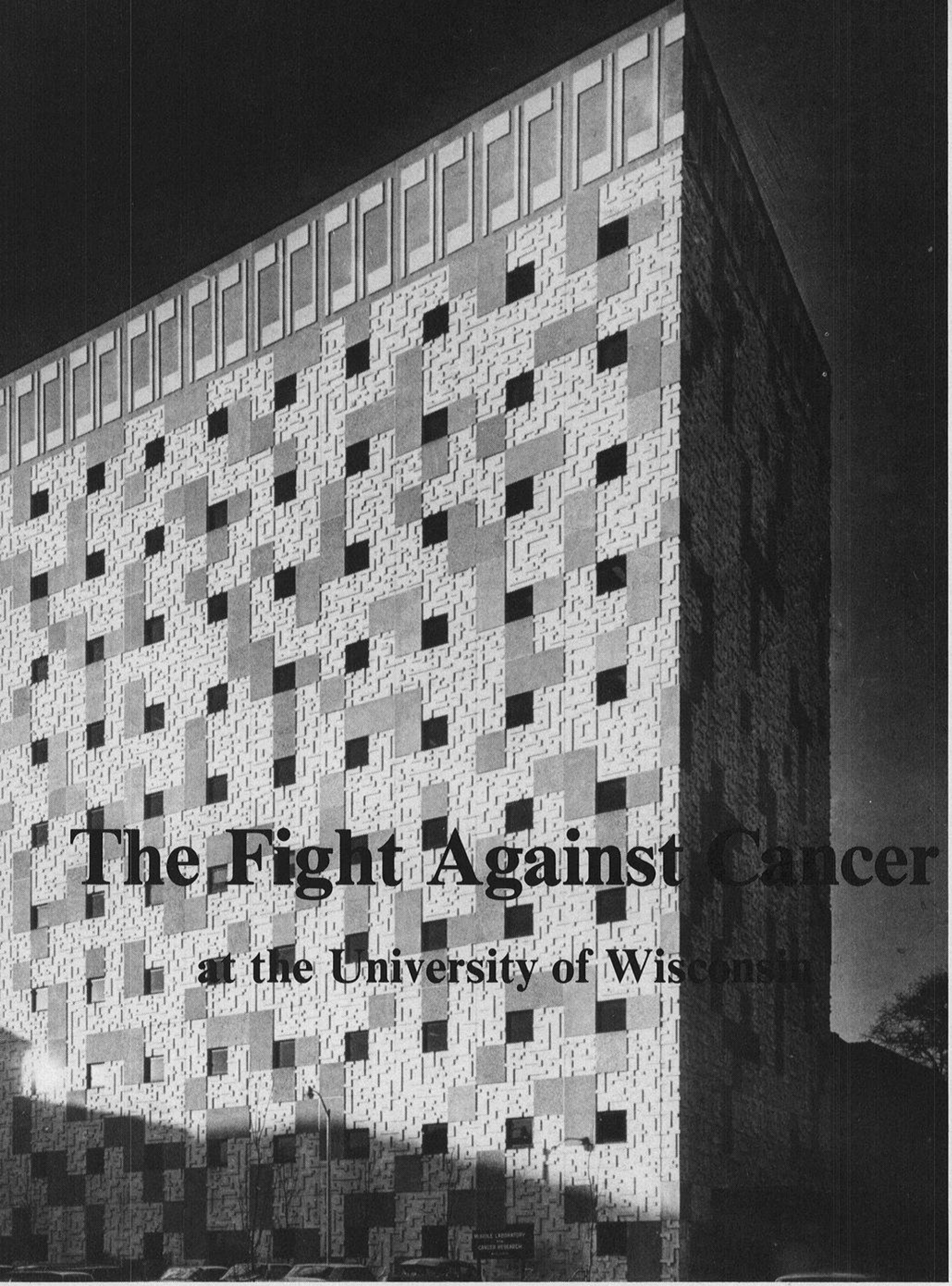
In 1981 the Marshfield Medical Foundation created a National Farm Medicine Center, based upon past health research related to agriculture, to use the information derived from this research to benefit agricultural workers everywhere. The foundation developed educational television programs and provided pertinent health information to farm publications. An instructional package including video tape and support materials was designed to help vocational agricultural teachers instruct their students in farm health problems and hazards. A cooperative study of milker's knee is being developed with the National Institute for Occupational Safety and Health. A second cooperative project will be conducted with the University of Iowa on farmer's lung.

Free health screening for skin cancer and hearing loss are provided during Farm Progress Days. The foundation provides authoritative speakers to farm groups on safety and health issues specific to the agricultural community. Five training seminars have been conducted by the National Farm Medicine Center to instruct emergency medical technicians in rescue procedures for life-threatening situations peculiar to the farming industry. Joint conferences with veterinarians and physicians encourage exchange of information and ideas about related health problems.

An important component of the Marshfield Medical Foundation is the department of biostatistics which permits students in applied mathematics at the UW-Stout to study statistics and their application at the foundation in Marshfield.

Since its modest beginnings in 1959 the Marshfield Medical foundation has developed a research effort of national prominence. The foundation received a Public Health Service Award in 1983 "for its role in developing, coordinating, and implementing a highly innovative primary health care program for disadvantaged unemployed persons in Wisconsin." The foundation continues to expand with new studies including a department of epidemiology, basic research investigations in cancer, and studies in preventive health care, specifically a program for the prevention of alcohol and drug abuse. The institution will continue to be devoted to research which benefits patients, the public, and the community. ☐

The Fight Against Cancer
at the University of Wisconsin



By Harold P. Rusch
Former Director of
Wisconsin Clinical Cancer Center
and McArdle Laboratory

The leading causes of death before the twentieth century were the result of infectious diseases of many types abetted by poor nutrition and sanitation, overcrowding, vermin, and ignorance. The beginning of the present century, however, was the turning point in the prevention and cure of many of these diseases through vaccination and improved sanitation. In the 1940s antibiotic agents were discovered which greatly facilitated the cure of some bacterial diseases. People lived longer, and cardiovascular disease and cancer replaced infectious diseases as the leading causes of death. By 1920 the mortality from cancer in the United States was second only to cardiovascular disease.

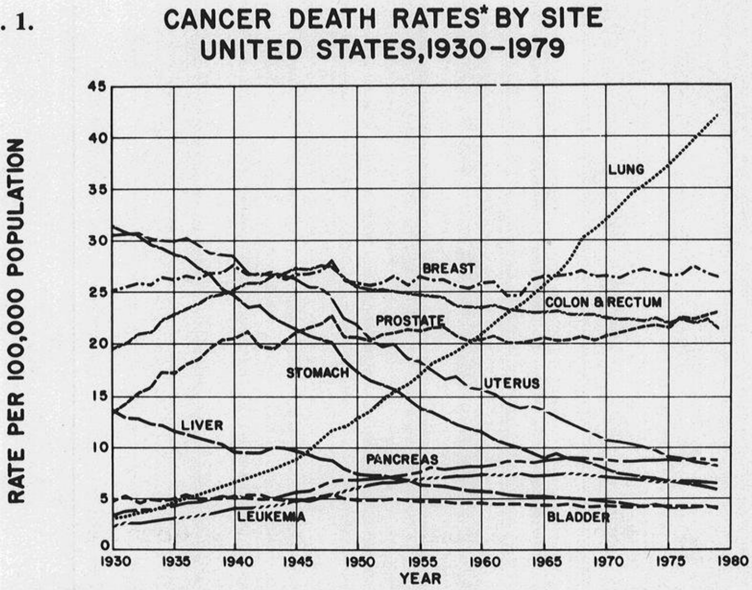
Information on cancer incidences in Wisconsin was unavailable until 1933 when the Wisconsin legislature declared it a reportable disease and assigned the task of reporting it to physicians. However, the information obtained was incomplete since many physicians failed to comply with the regulation. In 1976 the Wisconsin Clinical Cancer Center and the State Division of Health began a pilot project of a population-based cancer-reporting system which placed the responsibility of reporting on hospitals in Wisconsin. This procedure proved much more successful—a 93 percent reporting of all cases as compared to only 70 percent before the statewide system was implemented in January 1978.

There were 17,635 cases of cancer diagnosed in 1981 among Wisconsin residents and over 80 percent of these occurred in people over the age of fifty-four. However, cancer killed more children aged three to fourteen than any other disease. In 1930 there were 159 deaths from cancer per 100,000 residents, and in 1981 the number was essentially the same. These numbers for 1981 are identical to those for the United States as a whole and are age-adjusted to make the data for 1930 and 1981 comparable in spite of the difference in the age-structures of the population. The rate of deaths from lung cancer increased dramatically after 1930 as the number of people smoking cigarettes increased, while the incidence of other types of cancer has stabilized or actually decreased as in the case of cancer of the stomach and uterus (Fig. 1). The estimated cancer deaths for 1984 by site and sex are shown in Fig. 2.

For many people cancer is the most feared disease because of its lingering and painful nature. In 1936 at a symposium on cancer held at the University of Wisconsin, Glen Frank, president of the University of Wisconsin, in his opening remarks stated, "Cancer has been the most hideously persistent and the most persistently hideous enemy of mankind. But not all of its tragic consequences are the worst evil wrought by cancer. For every body that is killed by cancer, multiplied thousands of minds are unnerved by the fear of cancer."

It is no wonder then that people wanted something done to prevent or cure cancer, and the response first by private citizens and later by state and federal legislators was to provide funds. The first concerted effort to control cancer in Wisconsin was initiated by William Stovall, director of the State Laboratory of Hygiene. During the 1920s he worked to establish the Wisconsin Division of the Women's Field Army of the American Society for the Control of Cancer, which later was renamed the American Cancer Society. By 1928 his efforts led to an official interest in cancer by the staff of the Wisconsin State Board of Health and the State Medical Society. Soon after George Papanicolaou in New York City developed a test (Pap test) for studying smears of cervical cells, Dr. Stovall initiated a program to examine these smears in the State Laboratory of Hygiene.

Fig. 1.

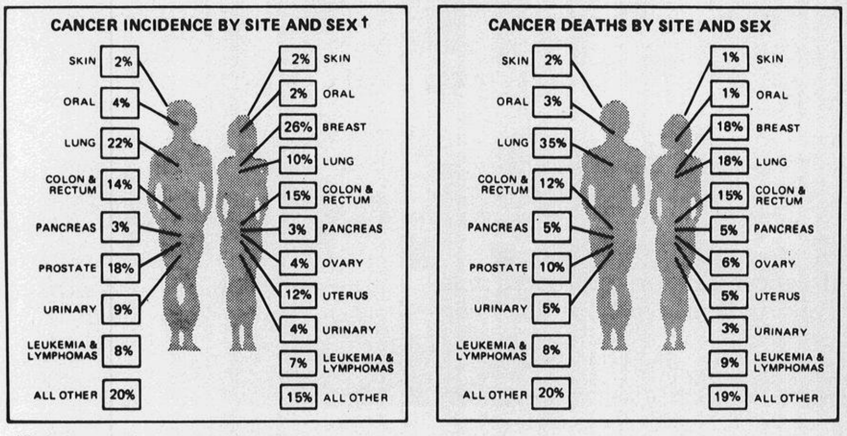


*Rate for the population standardized for age on the 1970 U.S. population
Sources of Data: National Center for Health Statistics and Bureau of the Census, United States.

Reprinted from "Cancer Facts and Figures," American Cancer Society, 1984.

Fig. 2.

1984 ESTIMATES



†Excluding non-melanoma skin cancer and carcinoma in situ.

UW cancer research initiated

In 1934 Jennie Bowman of Wisconsin Rapids left a bequest of $420,228 to the University of Wisconsin in memory of her father Jonathan Bowman, which allowed the university to initiate a program of research on the cause, prevention, and treatment of cancer. A committee consisting of President Glenn Frank, Dr. Charles Bardeen, dean of the medical school, and Prof. Edwin Fred, dean of the graduate school, decided to establish fellowships to support research by young investigators. The first three selected in 1935 were Mead Burke, Frederic Mohs, and myself. Dr. Burke resigned after one year, but Mohs and I made cancer research our lifetime careers.

I was an instructor of physiology in the medical school and, through the interest and kindness of Walter Meek, carried out my research in that department until 1940. I was especially interested in the causes of cancer and in the factors that controlled the growth of cancer. Certain pure chemicals, classed as hydrocarbons and azo dyes, had recently been isolated which could produce cancer in experimental animals. Together with colleagues I discovered that diets high in fats stimulated the onset of cancer while diets severely restricted in total calories retarded the onset of cancer. This work was reported in the late 1930s and early 1940s but had little general impact at the time; during the past ten years the role of diet in cancer has become a popular issue.

Evidence from several studies indicated that skin cancer was more prevalent in people more exposed to sunlight who had less skin pigmentation. Thus it seemed likely that excessive ultraviolet radiation was responsible for inducing cancer of the skin. I exposed mice to various wavelengths of ultraviolet irradiation which showed that the radiation between 2900 to 3100 Angstrom units caused cancer formation on mouse skin.

In the spring of 1938 a substantial amount of money for cancer research became available from a bequest by Michael McArdle, who came from Door County, Wisconsin, and eventually became president of the Sunbeam Corporation in Chicago. He died of cancer in 1935 leaving the money which amounted to $137,000 by 1938, to the university. William Middleton, dean of the medical school, obtained another $108,000 from the Public Works Administration to construct a four-story structure on the medical school campus named the McArdle Laboratory for Cancer Research. Van Potter, Betty and Jim Miller, Roswell Boutwell, Charles Heidelberger, and Gerald Mueller joined the staff of the lab. As the research prospered, the original building was replaced in 1964 by a new eleven-story structure constructed with funds obtained from the National Cancer Institute.

Research at the McArdle Laboratory has attempted to develop a basic understanding of the nature of normal and cancer cells, of the processes by which cancer cells arise, and of factors that can reduce the growth rates of cancers. Cancer cells apparently fail to respond to signals within the body that are important for the controlled growth of normal cells. Thus, whereas the growth of normal cells of each type is precisely tuned to the needs of the body, the growth of cancer cells may proceed relatively independently of such controls. Knowledge of the control mechanisms for the growth of normal cells is critical to a fundamental understanding of cancer.

The rapid growth of some cancer cells makes them somewhat specific targets for being killed by certain chemicals, which provides the basis of much cancer chemotherapy. An important example is 5-fluorouracil (5-FU). When Dr. Heidelberger found that 5-FU specifically inhibits an enzyme essential for the synthesis of DNA, a vital step in cell replication, he investigated its action further. His fundamental studies, together with those of his clinical associates at the University of Wisconsin, led the development of 5-FU as a cancer chemotherapeutic drug.

Investigators at the McArdle Laboratory have also been at the forefront in studies on the mechanisms by which cancers develop from the actions of certain viruses and chemicals. Howard Temin's studies on the class of tumor-inducing viruses called retroviruses gained for him the Nobel Prize in 1975 for his discovery of RNA-directed DNA synthesis. Dr. Temin provided an important new insight into the replication of the retroviruses in animal cells, one of several fundamental discoveries used by investigators in other laboratories to develop procedures for the cloning of genes. The studies of the induction of cancer by chemicals at McArdle have brought about a much clearer understanding of the multistage nature of this process. Other studies in the laboratory showed that cellular metabolism often has a role in the conversion of cancer-causing chemicals into the "ultimate" carcinogens which are the active forms in the body. These studies provided an important basis for the development elsewhere of rapid assays, using bacteria, for the detection of chemicals that may potentially be carcinogenic.

The research at McArdle is intended to untangle the intricate details about the way normal cells become cancerous and to contribute information about how such cells' growth can be controlled. There is need, however, for cancer centers that are more directly involved with the diagnosis and treatment of cancer in people. Frank J. Keefe, a United States Congressman from Oshkosh in 1947 introduced a bill to provide funds to construct facilities devoted exclusively to the diagnosis and treatment of cancer. The UW Medical School was selected and added a four-story structure to the east end of the hospital. Anthony Curreri, an associate professor of surgery, was named director of the unit which became a division of surgery.

Cancer treatment center added

The staff appointed by Dr. Curreri worked on factors that caused bladder cancer and on the treatment of cancer with chemical agents. The studies originally stimulated by the use of 5-FU and then by the introduction of other chemotherapeutic agents generated hope and enthusiasm among cancer researchers. In response to the belief that the effective treatment of cancer was within striking distance, Congress passed a cancer act in 1971 which provided funds to stimulate research with more emphasis on the practical aspects of the cancer problem. It permitted the establishment of fifteen comprehensive cancer centers to cover the entire spectrum of the cancer problem including prevention, diagnosis, therapy, public and professional education, and research with an emphasis on clinical problems. Until this time several centers worked on basic research, but only three in the country had a broad approach which included patient care. The new centers were to be established across the country to provide a better regional representation.

Because of my background of cancer research I was asked to organize a comprehensive center at the University of Wisconsin. I accepted the directorship of the Clinical Cancer Center in 1972, and Henry Pitot succeeded me as director of the McArdle Laboratory. In July, 1973, the center was designated one of the first six new comprehensive cancer centers, was awarded a grant from the National Cancer Institute, and was named the Wisconsin Clinical Cancer Center (WCCC). Another grant from the National Cancer Center provided funds to construct a six-story module on the north end of the new Clinical Science Center. When I retired in 1979, Paul Carbone, an experienced clinician, succeeded me as director. Dr. Carbone is also chairman of the Eastern Cooperative Oncology Group, which conducts clinical trials on cancer patients. There are twenty-eight full member institutions in this group plus 220 affiliated participating institutions which facilitate clinical trials with new cancer-inhibiting chemicals.

The Wisconsin Clinical Cancer Center has three divisions: clinical oncology, radiation oncology, and prevention and quantitative oncology. Besides the seven-story WCCC tower, the hospital has assigned ninety beds for adult oncology inpatients. In 1982-83 there were 5,024 treatments for inpatients and 10,000 visits to the outpatient clinics. Studies include the pharmacology of antineoplastic agents, tumor markers, endocrinology, and investigations on the use of interferon for treating cancer.

No review of cancer research at the University of Wisconsin is complete without including the work of Frederic Mohs, a member of the surgery department for many years who gained an international reputation for developing the most successful program known for treating cancer of the skin by a method termed microscopically controlled surgery. Only the main mass of the tumor is removed in the first stage; then sections of tissue surrounding the cancer are removed piece by piece and examined under the microscope to determine whether any cancer remains. If cancer cells are observed, tissue is removed until no more can be found. With this method Dr. Mohs reported a five-year cure rate of 99 percent in a series of 9,716 cases. His remarkable method results in relatively little loss of normal tissue and consequently much less disfigurement.

Investigations at Wisconsin and other cancer centers over the past twenty years have been encouraging. Cancer management today is becoming increasingly individualized both in diagnostic procedures and treatment. Early detection is followed by prompt surgical therapy, radiation therapy, or chemotherapy, often in combination. The following cancers a few decades ago had very poor prognoses—today they are being cured in many cases, or life is prolonged predominantly because of chemotherapy advances: acute leukemia, Hodgkin's disease, Burkitt's lymphoma, Ewing's sarcoma, Wilm's tumor of the kidney, sarcoma of muscle, choriocarcinoma, testicular cancer, ovarian cancer, and bone sarcoma. Unfortunately, treatment for some of the more common cancers such as those of the lung, pancreas, and large intestine has only modestly improved over the years.

In addition to the improvements already in use, recent develoments indicate that some cancers may be prevented, diagnosed earlier, and/or treated more effectively. For example, there is evidence that the chance of developing some cancers may be reduced by avoiding obesity; cutting down on total fat intake; eating more high fiber foods, including foods rich in vitamins A and C in the diet; being moderate in consumption of alcoholic beverages; and being moderate in consumption of salt-cured, smoked and nitrite-cured foods. Recent research also shows that some cancers are caused, at least in part, by activation or modification of protooncogenes—genes normally present and possibly essential for embryonic tissue development, which become dormant after embryonic growth has ceased. These may, however, be activated or modified by chemicals, radiation, or viruses later in life. Vaccines against certain viruses may eventually prevent some cancers. Early diagnosis is improved by scanning technics that utilize high frequency sound waves (ultrasound), computerized tomography (CAT scans), and nuclear magnetic resonance, all of which show the tumor's shape and location more accurately than is possible with conventional x-ray techniques. Treatment of cancer is also being constantly improved by the new chemotherapeutic agents and surgical techniques including laser instruments and by the introduction of hyperthermia treatments in combination with surgery and chemotherapy.

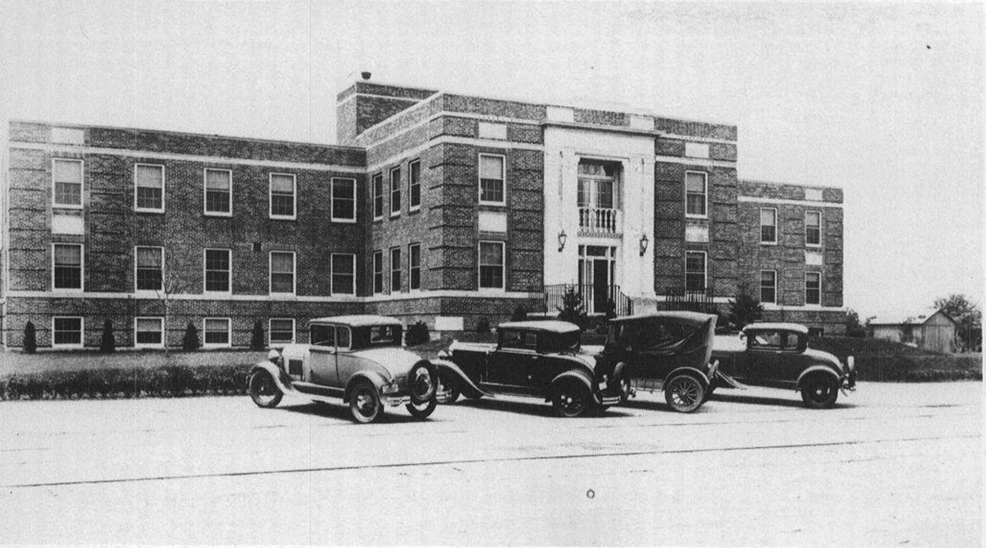
The study of the cause and treatment of cancer began very slowly at the turn of the century. It is estimated that before 1945 fewer than one-half million dollars were spent annually worldwide. Prior to that time funds for research were chiefly donations from wealthy people who experienced the death of a close relative. Most of these funds were used to establish cancer institutes; there were twenty such institutions, including McArdle, started before 1950. After World War II the interest in cancer by the public increased. In 1913 a group of physicians and laymen formed the American Cancer Society for the Control of Cancer, for the purpose of raising funds to support research on cancer. By 1945 the society had raised a total of $800,000, changed its name to the American Cancer Society, and had begun a more vigorous effort to raise funds for the support of research. By 1983 the annual expenditure amounted to $55,000,000, of which approximately $1,000,000 was awarded to the University of Wisconsin in the form of grants.

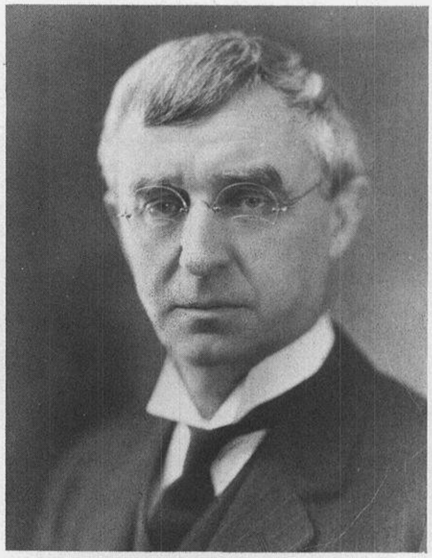
Members of Congress also became interested in supporting funds for cancer and in 1937 appropriated $700,000 for the National Cancer Institute which was used to construct a building for cancer research in Bethesda, Maryland. The amount of annual appropriations grew rapidly after the war, and by 1982 the amount appropriated was approximately one billion dollars. The funds are used to support research at the center in Bethesda as well as for research at educational and scientific institutions throughout the country.

Cancer is not a simple single disease but multiple diseases of many tissues caused by a variety of agents and requiring various treatments. Its biology and biochemistry are not yet fully understood, but excellent progress has been made, especially during the past ten years. Much more needs to be known but the answers are much closer than they were when work on the problem was started at the University of Wisconsin in 1935.

Additional information on the history of McArdle and the Wisconsin Clinical Cancer Center can be found in *Something Attempted, Something Gained* by Harold P. Rusch, 1984. Wisconsin Medical Alumni Association, 1300 University Avenue, Madison, Wisconsin 53706. ☐

The original Gundersen Clinic building opened on May 7, 1930.





Adolf Gundersen, M.D., founder of Gundersen Clinic

Gundersen Clinic

By Sigurd B. Gundersen, Jr., Director

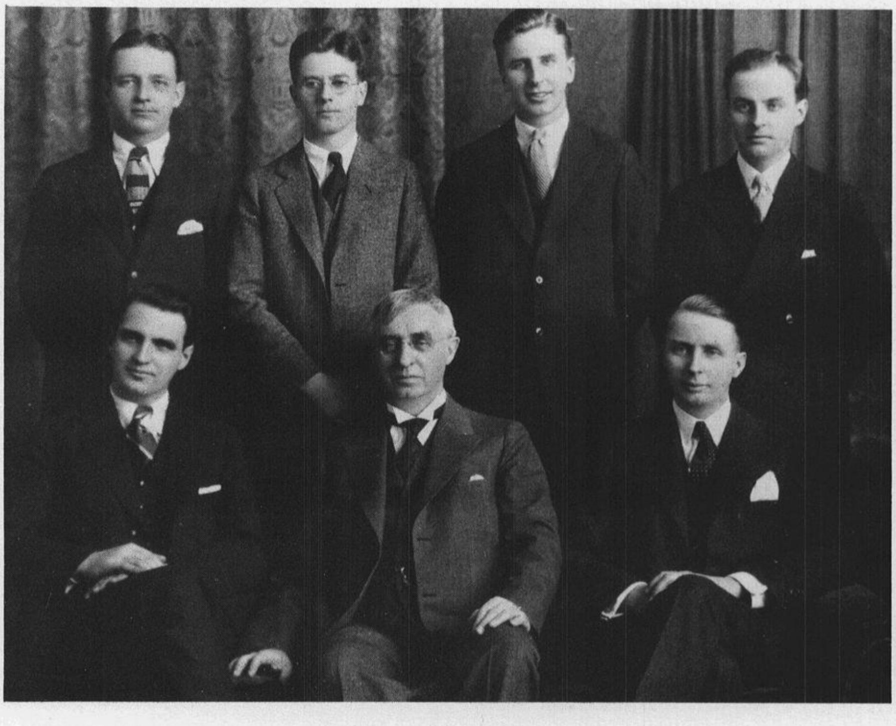
Gundersen Clinic, Ltd., located in La Crosse, Wisconsin, is one of the ten largest medical clinics in the country, with a staff of over 180 physicians and dental specialists, 668 full-time and 114 part-time paramedical and administrative personnel. It offers ninety-two medical, surgical, and dental services, forty-two support services, and fifty-one specialty clinics to serve the complete medical needs of residents of western Wisconsin, northern Iowa, and southeastern Minnesota.

The clinic is known for its multispecialty group practice, which permits comprehensive medical care for the clinic's patients. In 1983 medical care was provided through more than 368,000 patient visits to the clinic, an average of 1,300 patients daily.

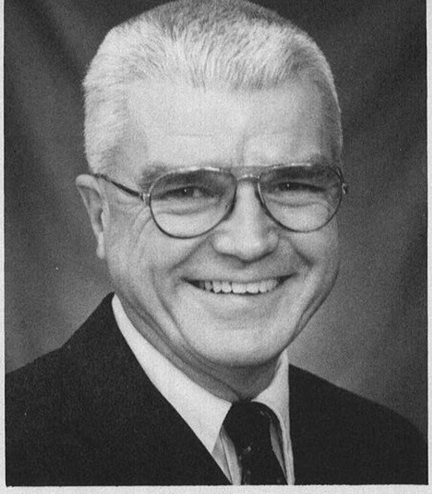
In addition to the main clinic, Gundersen has established primary care branch clinics in north La Crosse and in the surrounding communities of Blair, Independence, Onalaska, Tomah, Viroqua, and Whitehall, Wisconsin, and La Crescent, Minnesota. More than 85,000 patient visits were registered at the branch clinics in 1983.

Inpatient medical care for Gundersen patients has been provided by the adjacent La Crosse Lutheran Hospital since the clinic opened. The present 447-bed facility is primarily staffed by Gundersen Clinic

The Gundersen family physicians pose for a portrait. They are (standing, left to right) Alf, Sven, Thorolf, and Trygve; and (seated, left to right) Sigurd, Sr., Adolf, and Gunnar.



Aerial view of Gunderson Clinic–La Crosse Lutheran Hospital complex today



Sigurd B. Gundersen, Jr.

physicians. Hospital and clinic together provide such specialty services as coronary care, open-heart surgery, radiation therapy, diagnostic ultrasound, patient education, rehabilitation programs, counseling services, and specialized x-ray studies.

Gundersen-Lutheran is also the home of the Wisconsin Heart Institute, a regional trauma and emergency center, a kidney dialysis service, clinical and pathological laboratories, as well as geriatric outpatient services, specialty services which help make this a regional medical center. Gundersen also provides specialty clinics in such areas as infertility, pacemakers, the adult disabled, sports medicine, voice disorders, occupational medicine, genetic counseling, and neuromuscular disease, to name a few.

The tradition

In 1891 Adolf Gundersen, a Norwegian physician, came to America to practice medicine, bringing with him advanced medical training from Europe and a desire to continue studying medicine. Since La Crosse at that time lacked professional physicians, he settled there. The early years were difficult: long hours, little privacy, and loneliness. He was displeased that in America the medical profesion was treated with little respect. Though he thought of leaving La Crosse, he remained, and eventually his practice began to thrive. Adolph returned to Norway after two years in America to marry Helga Isaksaetre. They raised eight children, and six became physicians like their father.

Lutheran Hospital was built in 1899. Eventually, hospital officials and Dr. Gundersen agreed that he would establish a clinic nearby, specifically to staff the hospital. By 1927 three physician sons of Adolf had joined their father in medical practice. These Gundersens and several colleagues formed a partnership, purchased land next to Lutheran Hospital, and built the clinic, which opened in 1930.

Adolf strived to improve his profession at a time when knowledge and more efficient medical techniques were sorely needed. Despite simple conditions and the lack of sophisticated surgical equipment, Adolf earned a reputation as a highly skilled surgeon. A pioneer in abdominal surgery, he was one of the first surgeons to remove successfully the inflamed appendix, even though he received much criticism from his colleagues. He continued to operate for appendicitis and in 1912 reported success in 100 consecutive appendectomies before the International Surgical Society.

Medical practice is a Gundersen family tradition. Adolf's son Alf was among the first surgeons to perform transurethral prostatic surgery, a procedure to remove enlarged prostate tissue. In 1958 another son, Gunnar, was elected president of the American Medical Association. Dr. Gundersen left his medical enterprise in capable hands. After Adolf's death in 1938, his sons and colleagues were ready to take on the practice he had begun. Six Gundersens now on staff at the clinic are grandsons of Adolf Gundersen.

By 1950 the clinic medical staff had eighteen physicians, expanding to meet the medical needs of an ever-increasing volume of patients. By 1966 the clinic staff had grown to include forty physicians. Five major additions to the original clinic were built to accommodate staff growth. Today's clinic facilities comprise over 265,000 square feet.

Adolf Gundersen's belief in specialization and ongoing physician training served as the catalyst for the creation of formal medical education and research programs at the clinic. The Adolf Gundersen Medical Foundation was established in 1944 by three of his sons. Medical education is considered essential for attracting and retaining excellent physicians, helping them to keep pace with the continually changing medical needs of their patients and to understand newly developed diagnostic and treatment techniques.

Teaching

Gundersen Clinic offers forty residencies in internal medicine, oral surgery, pediatrics, and general surgery each year to new physicians and dentists. They are taught and trained by Gundersen Clinic staff, who, through teaching, learn more about their own specialities.

In addition to their residency teaching duties, every physician and dental specialist at Gundersen

Clinic teaches in the continuing education program. Two daily conferences are held in one or more medical specialities. Medical consultants from throughout the country come each year to Gundersen to share their knowledge.

Research

Patient-oriented research is an integral part of Gundersen Clinic. It begins with a problem or question that develops through the diagnosis or treatment of patients in the Gundersen Clinic-Lutheran Hospital medical center. Results of this research are applied directly to the care of patients at the clinic and hospital, as well as published in national medical journals for the benefit of other physicians.

Recent research conducted by clinic physicians (who also are engaged in full-time medical practice) include such fields as cancer, chemotherapy, endocrinology, gynecology, infectious diseases, orthopedic surgery, and rheumatology. Specific examples of clinical research include:

•An investigation into the diagnosis of the La Crosse strain of viral encephalitis, an inflammation of the brain caused by an infectious virus transmitted by mosquitos.

•A study to determine why solid tumors sometimes resist treatment by anticancer drugs.

•Development of a device for delivering insulin to diabetic patients for better control of this disease, replacing the traditional injection by syringe.

•A study of speech difficulties in patients with Parkinson's disease to determine if these problems can be diagnosed earlier and treatment assessed more effectively.

•A study to determine if antibiotic therapy can be combined with a new technique for chemically dissolving gall stones.

The clinical laboratory facilities that Gundersen Clinic provides, along with a stable patient population, have created an environment in which research can thrive. Access to medical records dating back to the 1920s enables clinic physicians to conduct long-term case studies. Funds to support research are privately donated; federal funding is not requested or accepted.

Gundersen Clinic always seeks more efficient ways to deliver its specialty medical and dental services to La Crosse area residents. One example of this effort is the clinic's outreach program. Until a few years ago, patients always traveled to La Crosse for all specialty health care from physicians and dentists at Gundersen Clinic and Lutheran Hospital. Today, though, certain of these specialty services are offered on an outreach basis at area clinics and hospitals that request them.

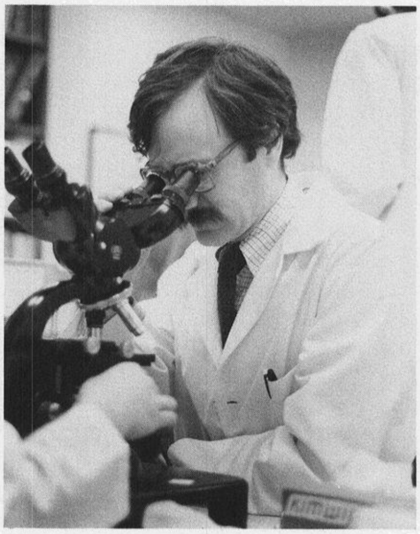
Twenty-five Gundersen specialists in seven fields of medicine and dentistry now provide outreach services in ten communities within a ninety-mile radius of La Crosse.

These specialty fields are behavioral medicine (psychiatry), cardiology, dentistry, obstetrics and gynecology, orthopedics, otolaryngology, and urology.

Last year, outreach specialty services were provided in local communities through more than 7,000 patient visits with physicians and dentists from Gundersen.

Specialty services in other fields of medicine and dentistry will be added to the outreach program as area clinics and hospitals request them.

Gundersen will also gradually expand its clinic-based staff, services, and facilities to keep pace with the growing and changing health care needs of La Crosse area residents.□



Medical research is an integral part of providing excellent patient care

Gundersen physicians and dental specialists continue to learn about their specialties through the clinic's education programs. The new knowledge they gain helps improve the quality of the patient care they provide.

Research and Service at the Waisman Center on Mental Retardation and Human Development

By Patricia Mitchell

"The manner in which our nation cares for its citizens and conserves its manpower resources is more than an index to its concern for the less fortunate. It is a key to the future. Yet . . . we as a nation have for too long postponed an intensive search for solutions to the problems of people who are mentally retarded." From a mandate to the First Presidential Panel on Mental Retardation, October 11, 1961.

Harry A. Waisman began his professional affiliation with the University of Wisconsin in the early 1950s, conducting research on certain causes of mental retardation. He worked tirelessly to bring about enactment of legislation mandating newborn testing for a metabolic condition known as PKU (phenylketonuria), and he became a strong proponent for the establishment of the center that would bear his name.

The level of attention focused on mental retardation and other disabilities that occur during development underwent a tremendous change in the twenty years following his appointment. Prior to 1950, minimal attention was directed to the problem of developmental disabilities by government agencies or private groups. There were, in fact, no significant community programs directed to the needs of people with developmental disabilities. The level of knowledge about those disabilities was equally sparse.

This state of affairs began to change in the latter part of the 1950s due to a number of factors: the growing involvement of parents and friends of people who were mentally retarded; efforts of several members of the U.S. Congress, and, most important for the University of Wisconsin, the appointment of a presidential panel in 1961 to develop a national plan for combating mental retardation and other developmental disabilities.

The panel's report in 1962 has had a far-reaching impact on funding and legislation for mental retardation and disabilities. The panel recommended a network of research and treatment centers at strategic locations throughout the country, interdisciplinary centers which were to further the understanding, treatment, and prevention of developmental disabilities. The UW-Madison was selected as the site for what would become one of only twelve centers of its kind—the Waisman Center on Mental Retardation and Human Development.

The Waisman Center was dedicated in 1973, two years after the death of Harry A. Waisman. His legacy, however, is continued by the 300 scientists, teachers, clinicians, and support staff who have been drawn together at the Waisman Center from twenty University of Wisconsin departments.

The primary roles of these faculty and staff have remained the same since the building opened: to carry out basic and applied research on human development and disabilities; to train scientists in the behavioral and biomedical sciences and clinicians in the delivery of health care services to people with developmental disabilities; to provide exemplary clinical services to people with developmental disabilities; and to conduct outreach programs with national, state, and local organizations.

This article will touch on some of the research and service programs at the Waisman Center and show how the conduct of these activities has contributed to progress in the field of mental retardation and developmental disabilities.

Research

Research at the Waisman Center is a blend of basic and applied research in the biomedical and behavioral sciences. In more than eighty research projects, Waisman scientists investigate diverse topics related to human development and disability. Many of these projects have increased our understanding of how normal development progresses; others have resulted in innovative diagnostic and treatment methods. Biomedical research in neurochemistry, neurophysiology, and neuroanatomy has focused on both basic and applied problems. Scientists have made discoveries on how information from the senses is transmitted and analyzed in the brain; they have examined chemical messengers (neurotransmitters) and the mechanisms regulating biochemical reactions in nerve cells; and they have learned about the structure and function of the hypothalamus, a major regulatory center of the brain involved in normal growth and development. These and other biomedical projects relating to the normal development, structure, and function of the brain are considered a first step in understanding development that does not follow the usual course.

The Waisman Center, located on the west end of the UW-Madison campus, receives funding from federal, state/university, and private foundations.

Medical director Raymond Chun and another pediatrician, Dana Filipovich, see a small patient and his mother, Linda Brown.

The other major area of research at the Waisman Center is in the behavioral and social sciences. Many of these studies concern the acquisition of a variety of skills from birth to adulthood, including hearing, vision, speech, language, and cognition. These projects have often produced more sensitive ways of evaluating and treating children with developmental disabilities.

A recent three-year study, for example, resulted in a sophisticated, highly accurate diagnostic procedure for detecting hearing loss in newborn infants. This procedure, which utilizes brain wave responses, enables a physician to identify hearing problems at a much earlier age than was possible with previous techniques and improves an infant's prospects for developing normal hearing capability.

Other research projects at the Waisman Center deal with treatment processes for individuals with disabilities and their families. These include the development of effective rehabilitative therapy for adults who are mentally retarded and the assessment and treatment of stress in families where there is a child with a developmental disability.

Clinical services

The Waisman Center provides comprehensive clinical services to people with developmental disabilities. These people come from all areas of Wisconsin and surrounding states, as well as from several other states and countries. They come for one or a combination of services the center has to offer in the areas of prevention, evaluation, diagnosis, treatment, education, and habilitation.

Some children who visit the center may be "at risk" for a disability; that is, there is a high probability that a disabling condition, while not evident now, will manifest itself later in the child's life. Other families may bring children to the Waisman Center because their child has a multiple and severe disabling condition that cannot be adequately evaluated or treated by their primary or secondary care physician.

Clinical services were restructured at the Waisman Center two years ago in response to what has become an increasingly common occurrence—the reduction of federal support for a health-related program. The result, however, has been a more comprehensive program, with services offered through a core developmental disabilities clinic and nine specialty clinics.

Prof. Ruth Bleier (neurophysiology, women's studies) uses an electron microscope to examine the structure of the brain.

Courtesy Office of Information Services, UW-Madison.

One measure of the clinical service unit's (CSU) success is the fact that, despite a new fee-for-service policy, the number of clients has increased steadily. In large part, this growth is due to the increased types of services available and the broader range of disabilities addressed. The CSU now offers services to certain children who probably would not have been able to obtain care in the past.

There are other service-related programs at the Waisman Center involving the education or rehabilitation of individuals of all ages. These are focused on very different populations: a habilitation center trains severely disabled adults to live in less restrictive community settings; a rehabilitation engineering center improves the quality and effectiveness of communication systems available to people with language or physical disabilities; and an early childhood program integrates normally developing children with children who have developmental disabilities in a preschool.

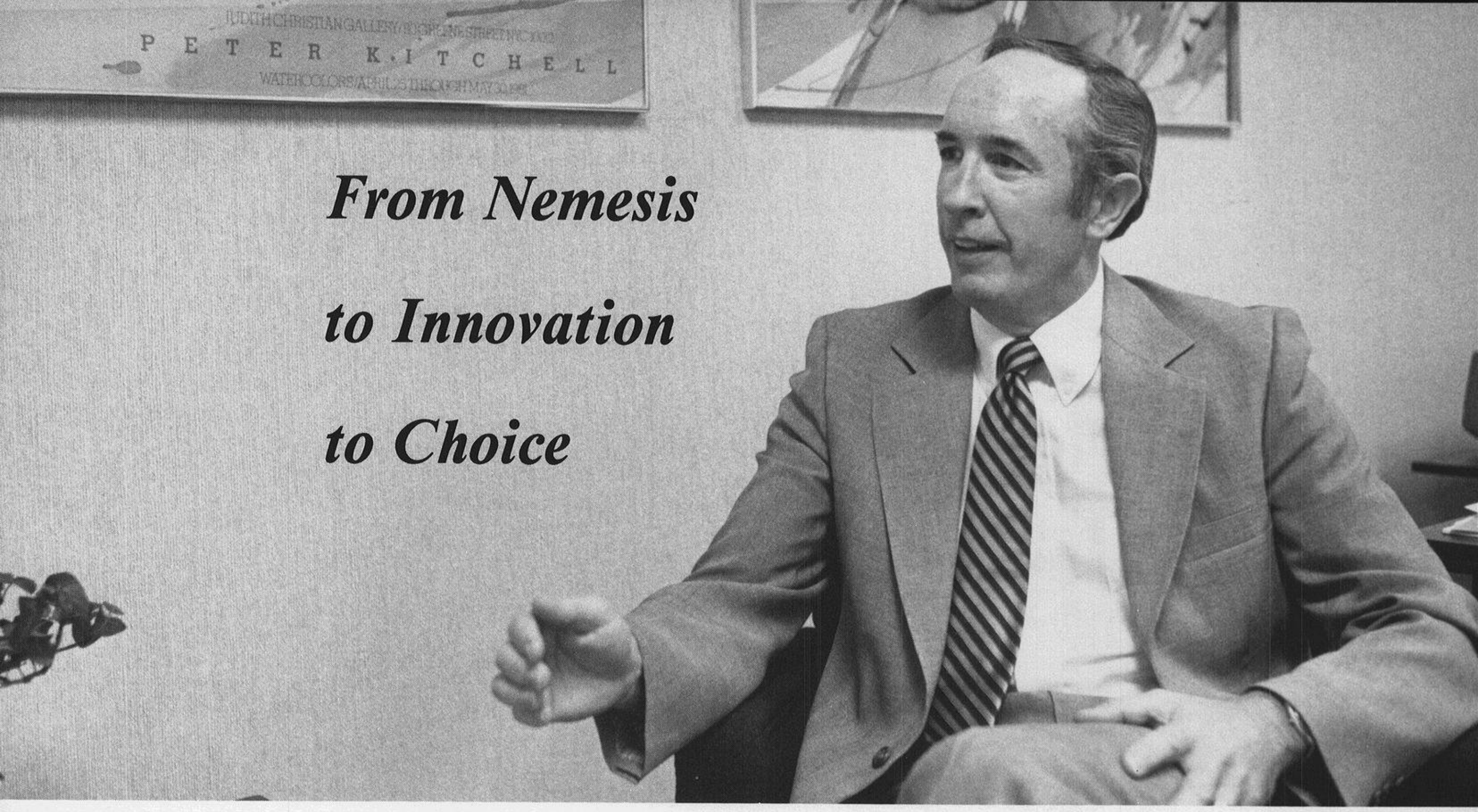
The link between research and clinical practice

An underlying philosophy at the Waisman Center is that a parallel commitment to research and clinical practice is crucial for the development of techniques that are really applicable to patient populations. The PKU test that Harry Waisman was so involved in is a good example of how knowledge gained through basic research in the lab led to a rational basis for treatment.

Another example is a newly initiated joint project between the Waisman Center, the state of Wisconsin, and private industry, with a goal of developing a computerized hearing aid. Involved in the project are university-based electrical engineers, computer scientists, physicians, psychologists, audiologists, and professionals from private industry. This research is focused on many of the common problems experienced by an estimated 80 percent of the current users of hearing aids. Related clinical services will be offered through a hearing aid dispensing clinic, which will fit people with hearing aids and give them the opportunity to participate in the research. This link between research and practice is expected to facilitate the development of a new type of hearing aid, as well as promote its evaluation and use by the public.

Installation is also under way at the center of several new technologies that will have important implications for research and clinical practice. A cytogenetics laboratory will enable scientists to examine previously unknown origins of certain genetic conditions and thus help clinicians to counsel and treat families. A magnetic resonance imaging facility, currently being constructed as part of a joint project between the Waisman Center, University Hospital, and the graduate and medical schools, will improve research and diagnosis of human diseases such as brain and spinal injuries, cancer, and metabolic and circulatory disorders. And a new facility for the study of speech physiology that uses real-time x-ray technology is expected to improve the diagnosis and treatment of individuals with speech disorders.

These and other ongoing research and service programs enable the Waisman Center to play an unusual and important role in the effort to understand human development and developmental disabilities. "It is the product of research and clinical application, two processes standing side-by-side at the center, that will lead to success," explains Waisman Center director Terrence R. Dolan. "More than ever before, we have the opportunity to eradicate some of the most troublesome disorders and conditions experienced in our society."☐



From Nemesis to Innovation to Choice

Health Care in Wisconsin (1974-84)

By Donald E. Percy — **President of Jackson Clinic, Madison**

> *It is of value to think of health as that condition of the individual that makes possible the highest enjoyment of life, the greatest constructive work, and that shows itself in the best service to the world . . . Health as freedom from disease is a standard of mediocrity; health as a quality of life is a standard of inspiration and increasing achievement.*
>
> Jesse Williams (1900)

Schopenhauer warned that "the greatest mistake a man can make is to sacrifice health for any other advantage." Yet, as a people, we tend to sacrifice our health more than we sacrifice for our health.

Having studied and observed previous decades of motion without change in our health care system, I welcome the opportunity to write about changes that are emerging. Two biases must be dealt with at the outset. First, one must recognize that more available medical care does not guarantee better health for our citizens. The medical system affects about 10 percent of the normal indices for measuring health. The remaining 90 percent is determined by factors over which the medical system has very little control—eating habits, smoking, exercise, stress, alcohol use, air and water purity, diet, socioeconomic status, and conditions in the workplace.

Second, the term "health care" is a misnomer. American medicine, as Eric Cassell, M.D. observes, is not a health care system—it is a sickness or illness care system. "It is expensive, it is overly devoted to its technology, it often cares more about diseases than sick persons, it needs a good hard shove to keep it moving (and to change it), but it is effective."

The past decade was characterized by major costly innovations in health care technology and technologists, by an increased aging population, and by rising consumer expectations and demands. Both patients and physicians were committed to "doing all that was possible," and in medicine the possibilities increased dramatically.

During this period, as infinite possibilities came face-to-face with finite resources, we were treated to an unprecedented number of articles and media presentations on the ways to control burgeoning health care costs. Ivan Illich railed against the evils of "licentious technology, clinical-social-cultural iatrogenesis, and the counter-intuitive behavior of large systems," and sought to "demystify medicine" by calling forth the "medical nemesis" to counter the "medicalization of life." Illich's charge that doctor-caused (iatrogenic) illness was not subject to medical remedies (nemesis) led some to believe that more vigorous reform must be imposed from without. Such was the prevailing sentiment ten years ago.

Former U.W. sociologist Robert Alford had noted in 1971 that previous reforms of the health care system advanced by government and others were merely absorbed by a system enormously resistant to any basic structural change ("dynamics without change"). He predicted that "bureaucratic reformers" and "market reformers" would increasingly assault the change-resistant industry. In Wisconsin, Alford's "bureaucratic reformers" focused their efforts on new facilities and new equipment in an effort to control disproportionate cost increases. The "need" for new items had to be "certified" to regional and state planning agencies and approved. In spite of these and other states' efforts, national health care costs, largely borne by government programs and third-party insurers, continued to increase at rates well in excess of the growth in Gross National Product (GNP).

While government sought to effect efficient and equitable health care, its principal entities (health planning organizations, regulatory systems, and peer review organizations) were, in the words of researcher Rudolph Klein, "saddled with the irreconcilable tasks of improving the scope and quality of health care while functioning at the same time as the instruments of cost containment." They sought to ration the growth of facilities without rationing the payments for services and remained fearful of the thought of rationing health care itself. Klein offered no solutions, but worried that "market model" solutions may "risk substituting the politically impossible for the merely difficult."

After a decade of writing and writhing in the wings, the "market reformers," stimulated by Alain Enthoven's prolific outpourings on "competition" and "consumer choice," were placed on center stage—by the *public* benefactors of health care who operated on the assumption that when all else fails, try competition—and a bit too often from the assertion that "competition is the answer, what's the question." The medical marketplace in the early 1980s rapidly became an arena for dynamics *with* change.

Acronyms flooded the country as did their substantive manifestations—HMOs, PPOs, DRGs, et al. The Wisconsin legislature, sensing a chance for basic reform of the system, passed a flurry of enabling statutes for HMOs, called for an overhaul of hospital rate review and other regulatory mechanisms, appointed a special study committee to fine-tune any subsequent oversights and dysfunction, and adjourned.

State, county, and local governments in the capital city, faced with burgeoning premium costs from more standard health plans for their employees, made Madison a laboratory of health care reform by calling for health maintenance organizations (HMOs) to bid on public employee health insurance. Rural hospitals and practitioners began to fashion their counterpart health maintenance entities.

Literally overnight the only existing HMO in Madison was joined by four others and, in the most significant change in many decades, health care *providers* became health care *insurers*. No longer were providers spending "someone else's money with no incentive to constrain outlays." A penny saved by health providers became a penny earned by health providers.

Public employees in Dane County enrolled in record numbers to have their health "maintained" through prepaid plans which were predicted to cost their employers (and thus the taxpayers) millions of dollars less. The suggestion that such savings might find their way into more direct forms of employee compensation was not lost on the employees.

Health maintenance organizations and preferred provider organizations (PPOs) began taking form throughout the state. With major research studies indicating that prepaid medicine (e.g. HMOs) provides quality at least as good as fee-for-service medicine, consumer resistance and physician deprecation began to dissipate.

Meanwhile, back in Washington, a new prospective payment system (PPS) approach for medicare patients in hospitals was seized upon as a quick fix for a system otherwise headed for bankruptcy. The DRG (try it phonetically) was not the kind of music hospitals preferred for dancing. By paying a fixed amount for each of 450+ hospital procedures called Diagnosis-Related Groups (DRGs) rather than an essentially uncontrolled panoply of individual per diem amounts, the federal government expected to save a bundle and forestall a medicare bailout. And where medicare goes, medicaid is not far behind.

Even though one national party implies that government is the solution and another argues that government is the problem, their elected representatives managed to bridge their partisan differences by DRG-ing down hospital costs rather than dredging up another round of regulatory measures.

Some hospitals began responding to DRG-induced shorter lengths of stay by diversifying (they like the term "vertical integration") into fields like home health care, home-based dialysis, etc. The hospitals' budgetary "Catch-22" inheres in the fact that the inpatient days being eliminated by DRGs (and, incidentally, by HMO rate bargaining) are the least-costly days near the beginning or end of a stay—the more costly care intensive days remain, and therefore a hospital's unit costs go up.

Along with reduced length of hospital stays has come a dramatic increase in same-day surgery and other procedures which can be handled, not only in hospitals, but also in many physician office settings. There have been more hospital staff reductions by attrition and layoff in the last eighteen months than in any other time during the 1974-84 period. It appears likely that the proliferation of hospitals in their present form is at an end, and, while the smaller rural hospitals are striving for a significant survival, the large urban hospitals are coming to realize that capacity reduction may not be the exclusive province of their competitors.

We can expect new kinds of "joint ventures" among different types of health care providers: nontraditional urgent care providers are taking up residence in abandoned gas stations or in new 24-hour-a-day emergicenters—taking aim on the nonemergent walk-ins who have kept hospital emergency rooms in

the black for many years and on the more traditional consumers who have begun to tire of repeated long waits in their doctors' offices.

One of the most subtle yet significant developments is the effect on physician motivation, productivity, and behavior of major increases in prepaid versus fee-for-service patients and a new sensitivity to consumer preferences. The traditional phrase "the doctor is ready to see you now" may give way to "the patient is ready to see you now, doctor." Office hours are expanding and, faced with the prospect that major chunks of their practice can disappear at annual reenrollment time for prepaid plans, doctors and clinics are engaging in extensive market research and advertising, and consumer questionnaires have become standard operating procedure.

State government health planning efforts and mechanisms are undergoing change as well. It seems that the providers outfelined the regulators by proving that there was more than one way to scan a CAT—and our society moved from a chicken in every pot and a car in every garage to a computerized axial tomography (CAT) machine in (nearly) every hospital. And now, more costly magnetic resonance imaging (MRI) machines promise a still clearer picture of our innards. With these and other developments, certificate of need programs have given way to new capital expenditure review procedures. Voluntary hospital rate review is yielding to a new Hospital Rate Setting Commission. HMOs appear to be such a good thing that many health providers not in one are seeking state legislative mandates that they be offered a chance to serve—and to be capitated lest they be decapitated economically in a prepaid market.

The slumbering giant in the health care cost containment arena, private sector business, is awakening in Wisconsin. A statewide Wisconsin Association of Manufacturers and Commerce (WMC) task force has fashioned its own "Primer" on health care costs—which was adopted for nationwide use by the National Association of Manufacturers. WMC followed this with a second publication to "guide" individual businesses seeking to hold down or reel in health care costs for their employees.

National statistics on employer costs for employee health insurance and care are regular media fare these days (e.g., Chrysler spends $6000 per employee on health care. Honeywell's health care costs were $124 million in 1983—equal to 40 percent of corporate profits). Employees, on the other hand, will not quietly welcome reductions in coverage and increases in copayments and deductibles. The real challenge here is how to involve them in a meaningful way in the decisions to be made.

It can be safely predicted, I think, that the stimulus for health care payment reform and thus innovation will swing from government to the private sector in the next few years. And what of insurance companies in all of this? One observer suggests that the real battle of the new competitive era will not be among hospitals, clinics, and individual physicians, but among insurance companies.

And what are our people to make of all this? They still have complaints. They like freedom of choice which prepaid plans must invariably restrict. They don't like to wait. They are distressed by government actions which, in the past, have ranged from social antibiotics to economic laetrile. As taxpayers, they want lower costs for the 45 percent of health care paid for by public funds. As employees, they want comprehensive coverage but are beginning to suspect that this may come with a restricted range choice, more deductibles and copayments, and increased responsibility for their own health maintenance.

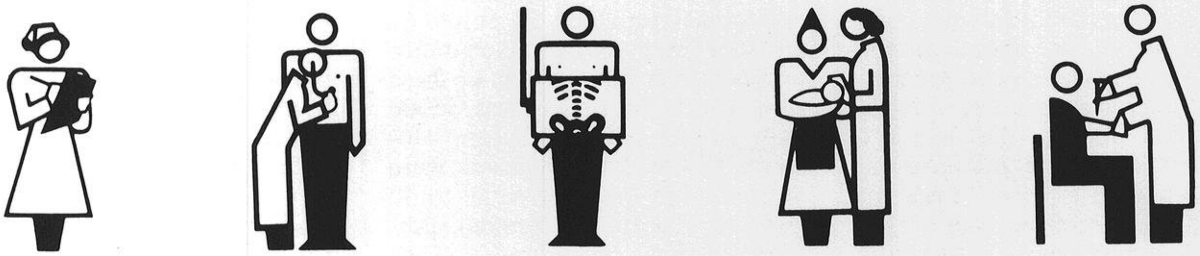
Ironically, it is the poor and involuntarily impaired among us who face the greatest risk amid all the changes detailed above. It is conceivable that the young and healthy will gain good, even excellent, care at lower cost, while the older, sicker, and impoverished among us will face the prospect of adverse selection by providers under expensive programs funded by increasingly grudging taxpayers. And, as investor-driven, for-profit enterprises accumulate hospitals and clinics to make money, it is not likely they will give too much attention to the overall integrity of the health care system.

Rationing dilemmas will abound. It remains to be seen as in Schopenhauer's opening quote, just what other priorities our people are willing to sacrifice for health. With critically ill patients consuming a nonproportionate share of resources (nearly one third of medicare hospital expenditures occur in the last year of a patient's life) and with adequate mental health services difficult to accommodate in multispeciality prepaid plans, we face difficult choices.

Aaron Wildavsky notes that up to now "we have not been morally nor politically equipped to make these choices. Medical technology seems to have thrust us beyond the guidance of our social-spiritual framework. Medical care has become a virtual right, but an understanding of the full dimensions of that right has not yet evolved as in the case of other rights of greater historical experience."

Medical sociologist David Mechanic (another UW faculty alum), writing of the transformation of health providers argues that "the most profound choices we face in the decades ahead are not in the management of new technologies, but rather how we manage sickness, disability, and functioning in old age over against the medical needs of other populations. The choices we make will have enormous implications for the economic status of professions, the vitality and survival of different types of institutions, and the financial success of major corporations" which employ most of our citizens. If you thought the past decade in health/illness care was dynamic and demanding, the next one promises to be even more so.☐

Coordination & Integration of Primary Care Services:



The Wisconsin Community Health Center Experience

By Paul W. Nannis and Kathleen Farnsworth

Migrant and Community Health Centers (M/CHCs) have a proud tradition of working to provide health and health-related services to medically underserved populations across the country. Since the inception of the Community Health Center Act in 1965, M/CHCs have gone through several programmatic and systemic changes. Some changes have resulted from changes in federal direction or initiative; more often change has occurred as a natural, evolutionary process of organizational growth and maturity. We have witnessed a conscious effort to diversify funding sources and to interject M/CHCs into the mainstream of the health care system as recognized providers of quality services. Through these efforts, M/CHCs have created new, supportive working relationships with state and local governments and continue to work towards a partnership with the private sector. By linking private resources with government funding, M/CHCs have furthered their own, and their community's, needs and interests.

In Wisconsin the M/CHCs have banded together in a statewide organization called the Wisconsin Primary Health Care Association, with the goal of promoting community-oriented primary care throughout the state. The following describes this effort in more detail.

The Wisconsin Primary Health Care Association (WPHCA) is a private, not-for-profit organization of migrant and community health centers and other providers, affiliate organizations, and parties interested in providing and supporting community-oriented primary health care services.

In Wisconsin approximately 617,000 people live in high priority urban and rural areas where they lack sufficient medical resources or face financial barriers to service in the private sector. People in these areas are disproportionately poor, elderly, and from minority groups. They experience high unemployment rates, little insurance coverage, and poor health often evidenced by high infant mortality rates and disabling chronic conditions.

In Wisconsin seven federally supported primary care health centers provide comprehensive health services to approximately 34,000 of the state's medically underserved people. By providing ambulatory health services, migrant/community health centers nationwide have decreased emergency room use and hospitalization by their clients. In some areas, the centers have shown reduced rates of infant mortality as well as decreased rheumatic heart disease among children in their service areas.

Administrative structure

Federal grants are awarded to these centers as part of the Migrant Health Center Program and Community Health Center Program, both administered by the Bureau of Community Health Services, U. S. Public Health Service, Department of Health and Human Services. Wisconsin's Division of Health (DoH) is involved with the M/CHCs, and staff within its Bureau of Community Health and Prevention participate in grant reviews and applications and other center activities. Wisconsin's centers work with both the U.S. Public Health Service and the state Division of Health's project officer.

Goals

The broad goal of the M/CHCs is to provide children, adolescents, and adults in urban and rural medically underserved areas with a comprehensive program of quality, family-oriented, primary health care services which:

- are easily accessible regardless of income status, cultural background, geographic location, or physical disability;
- offer continuity of care over time;
- are well integrated with secondary and tertiary level hospitals and specialty care as needed;
- are provided by a team of health professionals to facilitate comprehensive care; and
- are efficiently managed at community-based primary care centers with local governing boards which assure responsiveness to local needs.

The specific objectives of these programs are:

—to establish M/CHCs through funding of local public or private nonprofit community groups and institutions in underserved areas where other sources of medical care are not available or not accessible;

—to improve the quality of care and the efficiency of delivering services through the implementation of quality assurance programs, including continuing professional education and improved management practices; and

—to stimulate and support the coordination of private sector resources with local, state, and federal resources in order to develop an integrated system of care.

Generally, primary care centers provide routine medical and dental care and other health services people receive on a continuing basis from the health system, e.g. prevention, health maintenance, diagnosis and management of acute and chronic problems, and referrals as needed.

M/CHCs assure their patients access to secondary and tertiary care as needed through appropriate referral arrangements with specialists and hospitals. This is done through cooperative arrangements with other providers in their communities such as private physicians, state and local health departments, schools, social service agencies, mental health agencies, and voluntary health agencies.

Through special initiatives and emergency appropriations to M/CHCs, the Wisconsin Primary Health Care Association plays a unique role in other community-oriented primary care activities. The association has undertaken four projects—all committed to providing continued and additional low-cost community-oriented primary care to the people of Wisconsin, and to the extent possible, linking public and private resources.

The purpose of the *Health Promotion Linkages Project* is to develop a health promotion/disease prevention resource network and identify formal linkages among M/CHCs and other community health prevention resources.

The *New Starts Development Project* is one in which the M/CHCs, the association, and the University of Wisconsin, Division of Community Outreach and Development, are working to identify communities and assist them in developing applications for new and/or expanded activities as community health centers.

The *Primary Care Assessment Project* has three purposes: 1) to develop an agreement with the State Division of Health and the association on behalf of community and migrant health centers; 2) to develop an inventory of technical assistance resources, including people and materials, for community and migrant health centers so that they may more efficiently meet the primary health care needs of the people they serve; and 3) to assess the potential for shared services among community and migrant health centers.

ShareCare is the association's major private/public project. In March, 1983, Congress passed the jobs bill—P.L. 99-9—which provided supplemental appropriations to M/CHCs and also to states' Maternal and Child Health (MCH) Block Grants in order to expand the availability of essential health care services for the disadvantaged and unemployed, and to increase the availability of essential health services for disadvantaged children and mothers, respectively.

These seven migrant and community health centers of Wisconsin, **Northwoods Medical Cooperative (Minong); Family Health Center, Marshfield Medical Foundation (Marshfield); La Clinica de los Campesinos (Wild Rose); Milwaukee Indian Health Board (Milwaukee); Inner City Development Project's Capital Drive CHC and Dr. George Hilliard CHC (Milwaukee); Sixteenth Street Community Health Center (Milwaukee); and Oconto Falls Community Memorial Hospital's Rural Satellite Clinics (Suring and Lakewood),** with the support of the Region V Public Health Service, pooled their individual jobs bill allocations of $1.8 million.

At about the same time, the State Medical Society of Wisconsin had undertaken an effort called "We Care" whereby it encouraged its members to provide their professional services to the unemployed at no charge. The Primary Health Care Association, aware of the "We Care" effort, offered the society to pay for some of the ancillary costs associated with "We Care" if the physicians would donate their professional fees. The donated fee would then be used as the in-kind match necessary to obtain the federal jobs bills funds. The society agreed to the concept, and the State Division of Health elected to contribute an additional $2 million of its supplemental MCH Block Grant Jobs Bill appropriation to the ShareCare effort.

The Department of Health and Human Services (DHHS), Bureau of Health Care Delivery Assistance Central Office then added $840,000 from its 10 percent national set aside for special projects to the ShareCare Program. Thus the conceptual model of ShareCare was born. The WPHCA was selected by the M/CHC grantees to administer the ShareCare Program.

The WPHCA and its grantee members are responsible for the recruitment of ShareCare providers (physicians, clinics, hospitals, laboratories, radiologists, pathologists, etc.); operating enrollment sites; development of ShareCare Program policy (eligibility criteria, ShareCare enrollee benefits, reimbursable services, ShareCare reimbursement rates, etc.); marketing; monitoring claims processing; utilization and other operational elements of the program.

The WPHCA has enlisted into the ShareCare effort the additional participation of the Wisconsin Pharmaceutical Society and its affiliated county societies; State Medical Society's affiliated county societies; Wisconsin Job Service; UW Department of Family Medicine & Practice; UW Office of Rural Health; organized labor; Hospital Council of Greater Milwaukee; community action agencies; state public health agencies; county social service agencies; other public and private, nonprofit referral agencies; United Way; and Veteran Service offices. Blue Cross/Blue Shield United of Wisconsin and Marshfield Clinic have been contracted as fiscal intermediaries for the ShareCare Program's claims processing activities.

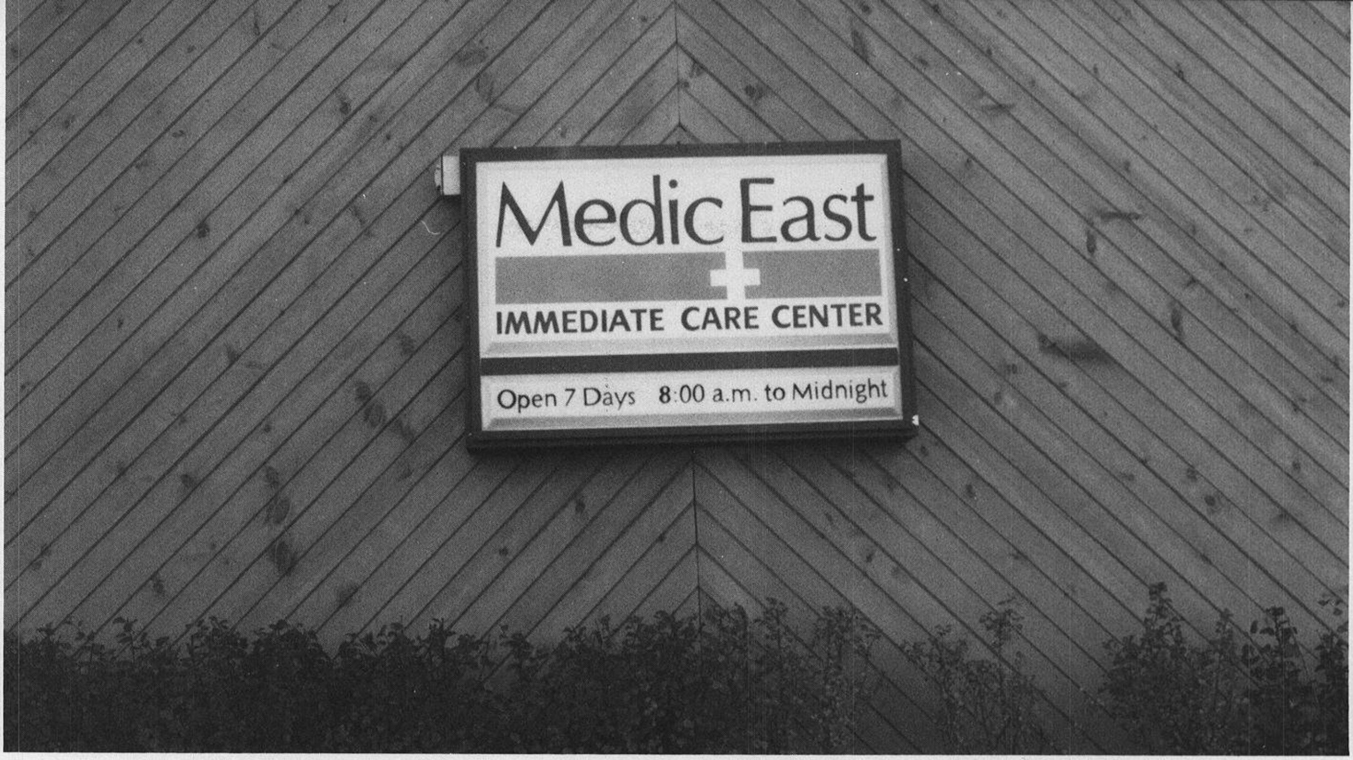
Persons eligible to receive ShareCare services are those individuals and families who have been disadvantaged by unemployment. Specifically applicants must (1) be involuntarily without work and available for work *or* be involuntarily working part time (twenty-five hours per week or less) and available for full-time work *or* be working more than twenty-five hours per week having experienced a reduction in wages and hours due to either an involuntary loss of a previous job or an involuntary reduction in wages and hours (in which case the applicant must also agree to go to Job Service and register for full-time work; (2) be without and ineligible for health insurance or other benefits which would provide for health care services provided by the ShareCare Program; and (3) have a family income at or below 150 percent of the federal poverty level as defined by the Office of Management and Budget and published in the *Federal Register* on February 17, 1983.

ShareCare enrollees receive complete outpatient physician services from participating physicians without charge and prescriptions from participating pharmacists free of charge. These services are specifically *excluded* from ShareCare: (1) care received in an emergency room; (2) home care services; (3) nondrug therapy, such as radiotherapy, physical therapy, occupational therapy, etc.; and (4) nonprescription drugs, *except* for insulin and insulin syringes. Labor and delivery are the only inpatient services covered by ShareCare.

Underscored in all of the association's projects, and especially in ShareCare, is the commitment and willingness of both private and public health care providers to pool their individual, limited resources (financial, professional, or material) in order to provide for the health care needs of those who lack access to it. Through the M/CHC relationship with the Public Health Service and the Division of Health, as well as their relationships with private sector providers, a strong base is in place for future joint endeavors.

The depth and breadth of the ShareCare partnership, while possibly contributing to the initial slow start-up of the program, have coalesced to a point where planning and working together have become second nature to those involved . . . thus affording the health care community broader perspectives for future undertakings.

ShareCare's more than 10,000 enrollees evidence the fact that newly unemployed, chronically unemployed, and the working poor constitute a segment of society which still warrants the attention of Wisconsin's public and private health care providers and policy makers. Time will tell how feasible the ShareCare model is in meeting this need. We take hope in the fact that these medical needs can be met, in spite of limited resources, through shared planning and programming. M/CHCs are proud to play a leadership role in this endeavor. ☐



Current Trends in Health Care

By Ralph Andreano
University of Wisconsin-Madison

Health Care Spending—A Big Issue

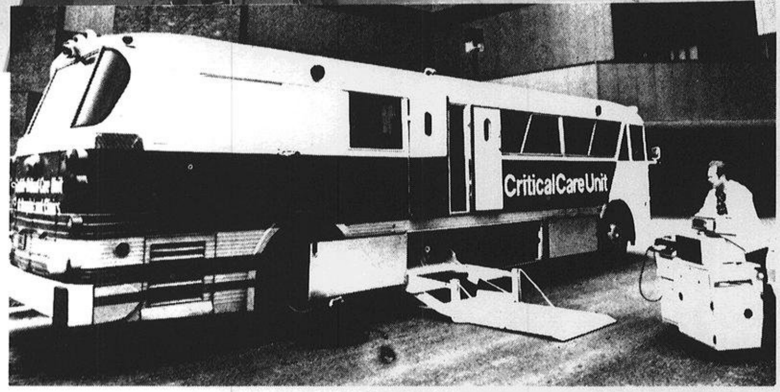
Health care is at once America's largest nondefense industry and its industry in greatest need of restructuring and repair. We spend over 10 percent of our Gross National Product (GNP) on personal health care. While this size industry generates jobs and incomes for lots of people and produces a quality of care unequalled anywhere else in the world, the resources devoted to health care over the long run constitute a drain on the size of productive investment in the American economy and hence on its potential for rapid economic growth. In the 1970s the health care industry grew, exclusive of inflation, at a rate twice that of the economy as a whole: Real GNP per head rose 2.4 percent per annum, but real personal health expenditures rose 4.8 percent per annum per head.

As a consequence of its growth health care is today one of the most studied, criticized, and dynamic industries in America. It is a major political issue in Wisconsin, in Washington, and even in the countries of our Western European allies. Underlying this atmosphere of crisis are two developments of the past one to two decades, changes which have made health care the highly visible issue that it is today.

The dramatic changes in the sources of finance for health care service. Before 1965 two thirds to three fourths of all health care was financed from private resources; since 1970 about one half of all health care is paid for by the public sectors,— federal, state, and local governments. This change in the sources of finance has naturally made governments more conscious of how "public" money was being spent. Other than defense and interest on the debt, medicare and the Social Security Trust Fund together make up the largest budget item at the federal level; at the state level it is medicaid, whose expenditures have risen an average of 15 percent for more than a decade.

Changes in medicine. In the past twenty-five years the practice of medicine has changed so dramatically that it has become a major contributor to the explosive growth in expenditure. New technology, new drugs, new surgical techniques, and new basic biomedical knowledge have transformed the shape of American medicine. And these changes, desirable as they are, proved to be very costly and lavish in their use of resources.

The fear that the 1980s may repeat the past decades' growth of health care expenditures makes health care an urgent political issue. Various forecasts with different assumptions show that, if left unchanged, per capita health expenditures (in Wisconsin as elsewhere) would triple yet again in the 1980s, and by the end of the decade more than 15 percent of our GNP would be devoted to health care service. The frightening prospect of what that would mean to business costs, increased taxes, and government budgets has pushed reform of the health care delivery and finance system and containment of its expenditure growth to the forefront of the state and the nation's political and economic agenda.



Trends worth watching

Against this background I would like to outline trends that seem to me to be major public policy issues for the 1980s. Virtually no stone is being left unturned by business, by government, and by the health professions to keep the scenario of the 1980s that frightens everyone—a tripling yet again of real expenditures—from occurring. The two trends I want to focus on are (1) attempts to reform the health care delivery system and (2) the potential impacts of an aging population on "everything."

Reform of the delivery system

There is a widespread belief fostered by the growth conditions noted already that the current delivery system is inefficient. What we economists mean by that is that we believe the amount of resources presently used to produce a given level of "output" could be reduced without a change in "quality." We believe that fee-for-service medicine, cost reimbursement for hospital care, and unlimited growth and usage of third-party insurance has produced a health delivery system where consumers have no incentives to discriminate between high cost or low cost providers, and insurance companies (government included) present no incentives to providers of care or consumers to seek the lowest cost alternatives consistent with a socially acceptable level of quality. This perception of these conditions, whether true or not, underlies current efforts to reform and restructure the health delivery system.

The current policy attempts to alter all these conditions by (1) pushing toward HMOs, PPOs, and other competitive measures; (2) regulating hospital and nursing home bed capacity and services; and (3) restructuring the payments to hospitals and ultimately to doctors from a retrospective to a prospective basis.

All or parts of these three efforts are currently underway in Wisconsin. Governments, especially, because of their vast buying power have been offering real incentives for those it insures to switch, for example, from fee-for-service providers to providers working under capitation. This was done in Wisconsin in 1983 with spectacular short-term expenditure reduction. The growth of HMOs, in particular, has been accelerated because of government's discretionary use of its purchasing power. The growth of HMOs has also spilled over to the other medical specialists practicing in the fee-for-service setting. All medical specialists have felt the need to organize themselves for competitive reasons either inside an HMO, or by forming an Independent Practice Association selling to HMOs, or even in PPOs directly competing with other providers. The leveraged use of purchasing power by governments and business on the structure, organization, and delivery mode of medical practice is already pervasive and will become more so in the years ahead. The direct aim of these efforts is to reform both the financing of services and the conditions and organization under which services are delivered. The underlying motive for these actions is to influence all providers—fee-for-service as well as capitation—to respond competitively and exert their buying influence on hospitals and other health care providers to contain the use of resources and hence contain expenditure growth.

At another level, attempts to reform the delivery system go directly to the method of payment to hospitals. Historically, hospitals were paid retrospectively; the thrust today is to pay them prospectively. The federal government which pays for medicare is responsible for the Diagnosis-Related Groups (DRG) system. But such states as Wisconsin also have set separate payment systems for its insured (medicaid) and in many instances have moved to regulate rates of payment to hospitals by private payers as well as through rate setting commissions.

These changes in hospital payment systems are expected to motivate hospitals to control their costs and to exert pressure on their medical staffs to cooperate. Eventually these changes in hospital payment systems are meant to rationalize hospital capacity and services and to make hospitals use resources devoted to patient care in an efficient, cost-effective way. Ultimately, the proponents of these changes hope to change hospital structure so that only efficient providers will survive. Many Wisconsin hospitals will fail; some already have.

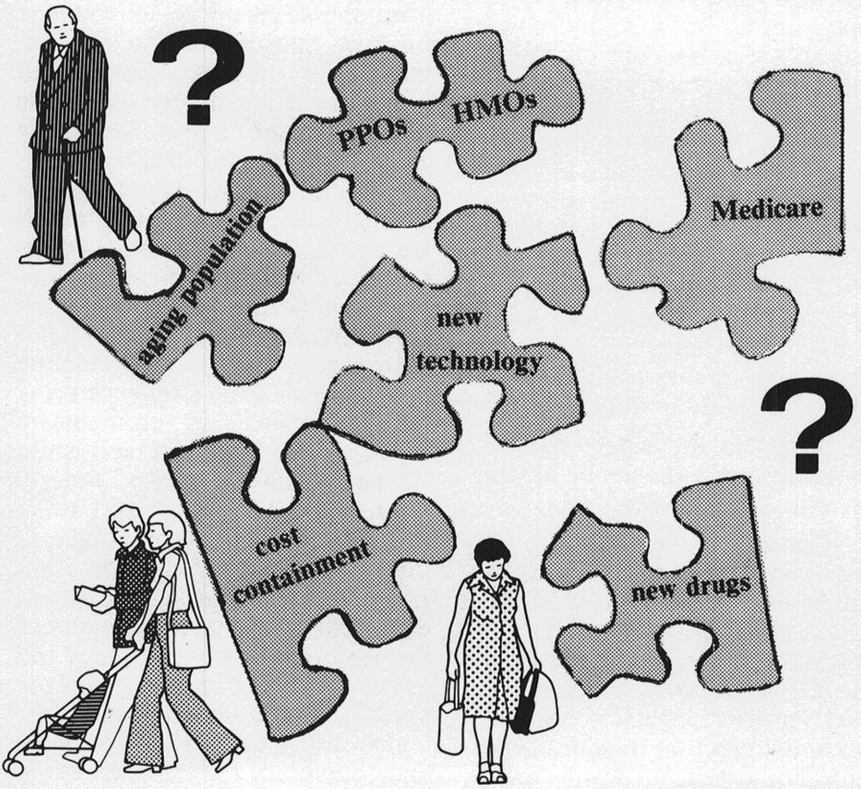
Finally, one might characterize a whole host of competitive developments as further attempts to restructure the health delivery system. The widespread development of ambulatory surgery centers, of day care centers for the aged, of the urgicenters and the like are all competitive responses (growing rapidly in Wisconsin) to reform health care service delivery to use fewer resources (and hence less expensive) than the traditional doctor-centered, hospital-based, fee-for-service delivery system.

I believe these attempts to restructure the health care delivery system are fundamental, permanent changes that public policy in the 1980s will reinforce and accelerate further.

Potential impacts of an aging population

Almost everyone is aware that the U.S. population is aging fast and that the age groups above age seventy-five are the fastest growing segment of the U.S. population. I want to emphasize some potential impacts from this that are incompatible with other efforts to contain costs and to reform the delivery system. Two effects from a growing aging population seem critical to me: the impact on our ability to contain costs and the social and political pressures the aged will generate for system reform.

We know that health expenditures for the population over sixty-five is three times the rate of all other age groups, and we also know that nearly 40 percent of health expenditures for those over sixty-five is incurred in the last six months to one year of life. Is American society prepared to ration care to the elderly more agressively? Can the rather special health care needs of the elderly be met by the current reforms in the delivery system? Will HMOs be good or bad deliverers of care for the elderly? Will the demand for hospital and nursing home care for the elderly be lessened by the current changes in the delivery and finance system? Will the elderly accept politically a still higher out-of-pocket (i.e. uninsured) cost for their care because out-of-pocket costs will surely rise?



Who can give a definitive answer to these questions? I think the major threat of an aging population is to keep demand for health care services high. If the changes in the delivery system can satisfy this demand without increased expenditure, I will be surprised. Higher personal costs for the elderly to finance their own care will be a major political issue in this country soon.

That brings me to my second point: will the aged population bring social and political pressure to continue the reform of the finance and delivery of health care services? The elderly will, I feel sure, become a greater political force. And we are, after all, a democracy where political clout at the ballot box influences public policy. If the elderly suffer from and thus reject the current system reforms and new financial models, will our politicians continue their reforms? Medicare benefits have been altered somewhat, and out-of-pocket costs for medicare have risen. But as yet no major changes have been made in this program. If DRGs do not contain Medicare Trust Fund hospital payments, will Congress turn the screws further or make concessions to the elderly? The one development ahead which will affect any effort to contain health system costs is the aging of our population. Current public policy makers have not fully appreciated the huge impact this will have. And when they do, will policy makers have the creativity to deal with it?

Let me conclude by noting that the 1980s and 1990s will be a period of constant turmoil and upset for the health professions. Concepts of care, concepts of medical education, and concepts of finance must and will change. And those who work in this environment will pay a deep personal price in their anxieties and in their uncertainties as professionals. But most of all creativity and commitment to service will be challenged in the severest way possible. ☐

Public Health in Wisconsin

Interview with Raymond Kessel by Patricia Powell

Raymond Kessel, coordinator of the Statewide Genetics Services Network Project, just finished a three-year Kellogg Fellowship. Dr. Kessel, who is on the staff of the department of medical genetics at UW-Madison, spent the period of the fellowship becoming acquainted with the Wisconsin public health system and in particular its maternal and child health system. He is active in such statewide organizations as the Wisconsin Public Health Association and the Wisconsin Prevention Network. He is serving as cochairman of the Association for Retarded Citizens' prevention committee and is a member of the prevention committee of Wisconsin Council on Developmental Disabilities. He also serves on several state advisory committees including the Superintendent of Public Instruction's Exceptional Education Advisory Council and the Bureau of Children with Physical Needs' Advisory Committee. Dr. Kessel was one of the organizers of a relatively new coalition for maternal and child health in Wisconsin. As a result of his Kellogg Fellowship and his recent state involvement, he concluded that while the health system in Wisconsin and the country is being reevaluated and new systems established to reduce the increasing cost of medical services, the role of the public health system should not be forgotten. While the traditional medical model of treatment for illness continues to improve and make substantial contributions to the health status of the population, it fails to emphasize how some of the health problems could have been prevented in the first place.

Q. **What is the public health system and its role in maintaining the health of Wisconsin citizens?**

The public health system is a combination of government and private nonprofit organizations which participate in providing health services. Public health systems have, in the past, contributed to our present health status through work with sanitation, clean water supply, immunizations, and communicable disease control. Some future health problems can only be addressed by a strong public health system, such as environmental contamination of our water and air, occupational health issues, prevention of developmental disabilities and birth defects, provision of primary care to the lower socioeconomic and disadvantaged groups of society, development and provision of good quality health education for all children and adults.

Q. **What is the single biggest problem affecting the public health system in Wisconsin?**

A. Our state government is not committed through organization or funding to a strong public health system. Unlike almost all other states in the country, the Wisconsin State Department of Health and Social Services includes social services and correction in addition to health. The division of health is also responsible for the mammoth medicare and medicaid programs, and over 90 percent of the division's budget relates to these reimbursement programs. There is and can be no focus on public and preventive health in a department whose functions are so dispersed and skewed towards payment for care. As a result there can be no leadership for a public health system from the department to create a uniform public health system throughout the state. Few or no state general purpose revenue (GPR) dollars are committed to city and county public health departments and private organizations except for the federal dollars which are passed through the state. Consequently, over one half of Wisconsin's population does not have access to a full service public health department. Much of the state time and money is spent simply carrying out federal medicaid and medicare programs. In maternal and child health we have received federal funding since 1935 under Title V but invested only a meager one million GPR dollars for family planning. Instead of using the federal dollars to expand and improve our service to meet the new needs and to solve existing problems, we use them to provide basic services which should be paid from our own state dollars.

Q. **What public health services ought to be offered?**

A. In 1980 the State Medical Society prepared a report on public health which recommended a full-service health system to include three broad categories: (1) community health services, (2) environmental health services, and (3) mental health services.

Community services should include communicable disease control; chronic disease control; family health involving prenatal care, well child clinics, family planning, and disabled children services; dental health; substance abuse; accident prevention; and nutrition education.

Environmental health services should include food protection; hazardous substances and product safety; water supply sanitation; liquid and solid waste management; water pollution control; occupational safety control; radiation control; air quality management; noise pollution control; insect and rodent control; institutional and recreational sanitation.

Mental health services should include prevention through education and outpatient services; detection and consultation; care for chronic patients whose needs exceed local or private capacity; development of standards for mental health services; and data accumulation on population movement and epidemiology.

Q. **In what areas does Wisconsin not fulfill these services?**

A. Everyone in the state should have equal health information and care available. The state should seek out those least likely to have access to private medical care and least likely to have information on risks. The state should identify risk factors and educate groups at risk. The state should determine leading causes of lack of health and build these priorities into the public health budget. The state should set standards for, say, maternal and child health care, and assure that such care is available to, for example, Milwaukee's black and Hispanic communities, the native American tribes, the mentally disabled living in the community.

Q. **You believe one of the main problems is lack of leadership in public health?**

A. Yes. I think Wisconsin lacks leadership and advocacy in matters of public health primarily because there is no school of public health in the state and thus no focus on this health model. The medical community is not properly informed about the role of public health because the medical schools do not introduce students to the concepts; the medical schools focus on treatment and cure of illness. Without a public health school there is no specialized knowledge produced for the state, no advocacy for public health programs, no public health research being done, no models generated for unified data collection on problems and solutions. No one studies the population near a polluted well to determine the long-term effects. No programs gather health statistics and relate these specifically to environmental issues. Prevention of health hazards has a low priority in the state because the concepts of public health are not properly put before the people and the legislators.

Q. **Who should be providing public health services in Wisconsin? Who is trained for this work?**

A. For a public health system to be a success it requires a sharing among many professional disciplines. Unfortunately, health systems are dominated by physicians, who are generally not trained in the philosophy of public health. The few who are have provided excellent leadership. Other professionals who *are* well trained in public health—such as public health nurses—should be equal partners in implementing health care policy.

Q. **You've outlined some general long-term problems you see in health care in the state. Do you see specific issues coming to the forefront in the next few years?**

A. An issue of public health the state must consider is health services for mentally disabled and handicapped people who were "mainstreamed" in the 1970s, when we began to remove people from public residential facilities and set them up in small community residences. This deinstitutionalization shifted the dependence of the mentally retarded and disabled from specialized health services to existing health services in the community. A group which has greater than normal health care needs is, under this system, receiving less monitering of their needs and the care they receive now than when in institutions. The community health system may not be prepared to provide proper care for specialized, sometimes rare disabilities. Practitioners insufficiently trained in behavior management may be reluctant to provide care for the mentally retarded. HMOs certainly have a financial disincentive to take on the health care of previously institutionalized adults because of high use and costs. And who will moniter the quality of care from multiple providers?

Let me give an example of some problems we recently found. In Green Bay the Association for Retarded Citizens day care program found twenty-two children who have one or two parents who were mentally ill or retarded; fifteen or sixteen of these children themselves were showing signs of developmental disabilities. In Brown County ninety-five children were identified who have one or two mentally retarded or ill parents and fifteen unmarried mothers who are retarded.

One reaction might be "we told you we should not let these people out into the community or at least sterilize them." We *should* be thinking "how can we teach these people family planning, parenting skills, and basic health care?" We don't even have the kind of information collected to tell us if these children are showing genetic problems or the lack of proper care by their parents. We have no systematic means for evaluating all these children.

Q. **Since you're involved in maternal-child care programs. can you give a status report on this particular aspect of public health?**

A. In Wisconsin maternal and child health has not been a major issue for the legislature, the Department of Health and Social Services, the professional community, or the general public. Wisconsin, despite its excellent social programs, has invested less money than most other states in this area of public health. The public county health programs lack sufficient funding, coordination and planning, and continuity. The private sector, which has traditionally emphasized intervention and treatment, has established, for example, an excellent perinatal system for high risk mothers and babies; yet it has done little to prevent people from entering that very sophisticated and expensive system. The Reagan administration's funding cuts for maternal and child health—including family planning, crippled children's programs, genetic counseling, supplemental food program for women, infants, and children (WIC)—have not yet been replaced by state government dollars. However, in response to budget cuts several organizations including the March of Dimes, the Center for Public Representation, the Division of Health, and other private groups have initiated Wisconsin Maternal and Child Health Coalition, now composed of twenty-eight statewide organizations, determined to identify key problems and set priorities.

The coalition is the first step in providing leadership to improve the comprehensive maternal and child health program in Wisconsin. In June 1983 the Department of Health and Social Services established the Healthy Birth Task Force, which includes representatives from coalition organizations, to provide a three-year plan for a comprehensive program of preventive maternal and infant health services. The task force determined that low birth weight, birth defects, and inadequate infant health and family support services were the major impediments to a healthy birth and first year of life. The task force recommends a public/private sector partnership to identify mothers at risk, to provide outreach education and care, to train health care providers to ascertain and meet needs of the client. This report is one step forward; what we need now is state funding.

We can prevent the burdens of lifelong handicaps and can solve the problems of teenage pregnancy, chronic illnesses among children, preventable injuries, congenital anomalies, child abuse, if we are seriously committed. We must invest our energies and resources in improved health programs for all citizens regardless of racial, ethnic, economic, age, social, or geographic factors. We need to make public health, especially maternal and child health, a major focus of our public policy agenda in the next few years.☐

Clinical Genetics in Wisconsin

By Renata Laxova

Director, Wisconsin Clinical Genetics Center

The sound of sledgehammers upon marble was different from anything I had ever heard before. It was late at night, and the six men, intent upon destruction, did not see the young student emerging from the building opposite the monastery. Next morning, no one seemed to notice that Mendel's statue had disappeared without trace from the center of the square which no longer bore his name. No one seemed to notice that the distinguished elderly professor of biology who had so meticulously maintained the color ratios within each filial generation of Mendel's flower garden, was no longer available to teach his classes.

In central Europe in the early 1950s the restrictions of the state and its party machinery were the restrictions which encased the university. Since the laws of heredity were incompatible with party philosophy, they were forcefully eliminated from the university curriculum. Genetics was taught secretly, at night, in small groups, accompanied by visions of labor camps or, at best, expulsion from school.

It was fortunate for most of us that only a few clandestine meetings were necessary to learn what was known at the time about human and medical genetics. Today, a little over thirty years later, medical genetics, like the pseudopodia of an amoeba, penetrates into every branch of modern medicine. Its evolution, like that of the amoeba, has been spectacular.

Its excitement is evident from James Crow's delightful overview in this journal. Like other dramatic developments, these, too, have attracted the attention of the mass media; most of their readers and viewers are unaware of the gap between fundamental scientific discoveries and their practical applicability. They revel in the frequently unrealistic ethical dilemmas potentially created by new knowledge and techniques. Sensational issues such as gene manipulation and regulation in the creation of human super-races, the implications of prenatal diagnosis, abortion, the latest Baby Doe case capture the headlines almost daily.

Unfortunately, the acquisition of accurate information by both the professional and lay public of the true significance, practical applicability, and benefits of medical genetics for a large segment of the population has lagged behind. Both medical and clinical genetics (the science of medical genetics applied to the service of families and populations with an incidence or risk of genetic disorders) are relatively new branches of medicine and still mostly practiced only in university settings. Regional, nonuniversity based genetics centers are a vision of the future in most states. Few families in need and fewer physicians are aware of the comprehensive nature, types, and benefits of available clinical genetics services.

An overview follows of examples of families who can benefit from genetics services today, together with a description of some techniques and options available to them. The unique organization in Wisconsin through which the university reaches out to provide services to all who need them is also mentioned.

An estimated 20 percent of the population have themselves or within their family a disorder or a risk which could have genetic implications. This proportion of the population, representing some 200,000 families in Wisconsin, includes those at risk for the recurrence of a disorder and those at risk for its occurrence for the first time. Examples of the former are families who have a member born with multiple malformations with or without mental retardation (3 percent of the population); those with an incidence of a single birth defect, e.g., congenital heart disease, cleft lip and/or palate, spina bifida (1 percent of the population); families with growth disorders (dwarfism, others) (1 percent); with common diseases known to 'run in families' such as diabetes, mental illness, cancers, etc.; families who have suffered pregnancy loss (approximately 40 percent of early spontaneous miscarriages have a chromosome abnormality), neonatal death, or stillbirth; and families with an incidence of a disease known to be inherited, such as cystic fibrosis (1 in 1,600 newborns), hemophilia, muscular dystrophy, neurodegenerative disorders like Huntington's disease.

Families at risk for the occurrence of a genetically determined disorder are those in whose genetic makeup or environment there are specific predisposing factors associated with increased risks. For example, couples who are of similar ethnic origin are at higher risk for an incidence of a severe recessively inherited disorder in their offspring, e.g., blacks for sickle-cell disease (one in ten carries the trait), Ashkenazi Jews for Tay Sachs (one in thirty carries the trait), whites for cystic fibrosis (one in twenty carries the trait), and other severe disorders. Carrier testing and screening tests are available for some of these, followed by prenatal diagnosis when a couple at risk becomes pregnant.

Pregnant women exposed to potentially hazardous physical, chemical, medical, or other (including ingested) agents at home or in their work place can be informed and

Renata Laxova offers genetic counseling to a young couple.

helped through our recently established Wisconsin Teratogen Project.

Couples of increased parental age, at risk for fetal chromosomal abnormalities or possibly the incidence of spontaneous dominant mutations, can be offered prenatal diagnostic tests in many instances.

When a family is referred for genetics services, the medical geneticist establishes the diagnosis in an affected individual and helps the patient and all family members understand its implications, prognosis, and management; in addition the patient and family are helped to understand who else is at risk of developing the disease, who is a carrier of it, who is at risk of having offspring with the disease, and what options are available to minimize or prevent recurrence.

The above is, in essence, the definition of genetics counseling, the effectiveness of which is measured, not by the number of abnormal births prevented, but by the degree of understanding by the patient and all family members, of all implications of the specific family situation in question and of all available options. Reassurance that a relative is not at risk is also an inseparable component of effective genetics counseling. An attempt must be made to answer all parts of the typical questions asked in the genetics clinic: Why has this happened to us, what did we do to deserve this, what is the cause, what can be done about it, is it going to happen again, what can be done to prevent it?

Some of the more recent options available to couples at risk for offspring with severe genetically determined diseases include artificial insemination, in vitro fertilization, ovum transplantation (in women at risk for disorders carried on their own X chromosome, attempts have been made to transplant ova from a different donor, fertilized by the husband of the woman at risk), surrogate motherhood, others. For the past ten years, by far the most widely accepted modern method for the prevention of genetic disorders, apart from contraception and newborn screening for the prevention of severe consequences of some genetic disorders of metabolism, has been prenatal diagnosis through ultrasound and amniocentesis, at sixteen weeks of pregnancy. The option exists to terminate the pregnancy if a fetal abnormality is detected. Of all couples undergoing such tests, the majority (96.5 percent) go through the remainder of the pregnancy reassured that their baby does not have the disorder for which it is at risk. Of the remaining 3.5 percent in whom an abnormality is detected (most frequently a chromosomal one, e.g., Trisomy 13, 18, or 21, a severe open defect, or lethal metabolic disorder), about three quarters elect to terminate the pregnancy, one quarter are helped to prepare for the birth (and, frequently, death) of their handicapped baby. Those who elect to terminate, are helped to cope and live with their decision and grieve for their loss.

Ultrasound itself has recently become a valuable tool in the diagnosis of many fetal malformations which would not be detected by other methods. They include limb defects, hydrocephalus, obstruction of the fetal urinary or digestive tract. As a technique, ultrasound has almost replaced fetoscopy in fetal visualization, although for fetal tissue sampling (rarely indicated) fetoscopy still remains the technique of choice.

Some of the abnormalities mentioned above lend themselves to potential intrauterine intervention in the form of fetal surgery. This is currently controversial and experimental since only a few instances have been reported with objectively improved outcomes. Early prenatal regulation at the molecular level on the other hand, although still only a theoretical possibility, will enable true intervention in the future which could result in the actual causative, as opposed to symptomatic, treatment of genetic disease.

A step toward that goal is a new technique called chorionic villi sampling (CVS) which enables some prenatal diagnostic procedures between eight and eleven weeks of pregnancy as opposed to amniocentesis at sixteen to eighteen weeks. In this technique a sample of chorion (part of the fetal surface of the placenta) is withdrawn by catheter through the vagina. Its advantages are dramatic: it must be done in the first trimester with test results available within days; thus decisions (also to terminate if applicable) are made before the end of the twelfth (as opposed to sometimes even the twenty-second) week of pregnancy. More material is available from the chorion to enable the study of DNA than from amniotic cells, and different, many more single gene disorders are potentially diagnosable. Disadvantages include a current lack of accurate information as to the risks (infection, pregnancy loss, fetal injury, hemorrhage, etc.) associated with the procedure; its inappropriateness for testing any disorders associated with the need for amniotic fluid investigation, e.g., neural tube or other open fetal defects; and, above all, the potential for commercial or other abuse (sex selection, etc.).

All the techniques mentioned above bring to mind many ethical issues. For example, once certain intrauterine procedures (gene manipulation, surgery, etc.) are proven to be truly beneficial to the future infant, should they become mandatory? Should a couple have the right to refuse (the mother also faces risks) a procedure which could cure their future baby of a devastating, possibly lethal disease? Do they have the right to choose abortion instead? If so, should they not have terminated the pregnancy before undergoing extremely costly, time consuming, and complicated procedures? Whose financial responsibility should this be?

At present, most genetically determined disorders are severe, as yet untreatable, and associated with much emotional trauma, guilt, anguish, and confusion for patient and relatives, healthy as well as affected carriers of the gene or chromosomal abnormality in question. It is up to the medical genetics team to ensure that ongoing, frequently lifelong support is available to the family in the person(s) or team(s) of compassionate and empathetic individuals who have some understanding of the underlying genetics issues.

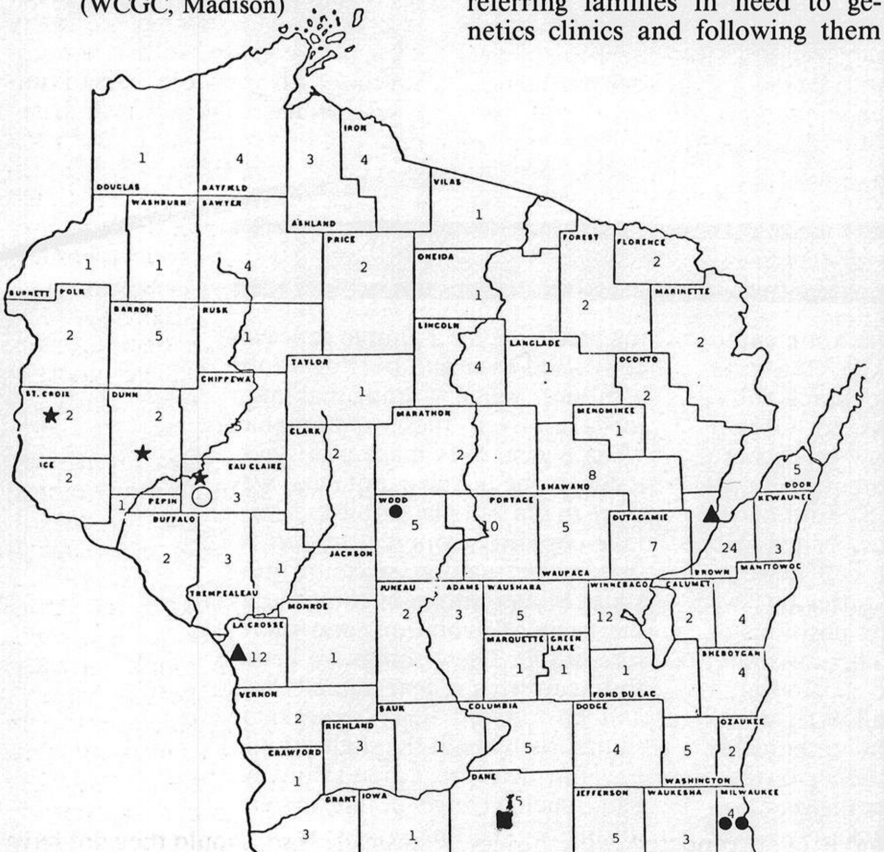
In Wisconsin we have a unique system whereby a network of individuals, called genetics contacts, (mostly health professionals, social workers, nurses, teachers, etc.) are trained to provide such support to families (see figure). They work closely with us in identifying and referring families in need to genetics clinics and following them after their appointment. A quarterly newsletter, "In Contact," informs them of current issues in clinical genetics. There are two or more genetics contacts in every county of the state who cooperate closely with the university-based center, as well as with the nearest facility with any genetically related services. In Wisconsin, we have another unique system of "triage" of genetics services. It is made possible through the existence of a group of relatively new professionals, genetics associates (GAs) or counselors, for whom we have one of five two-year master's degree training programs in the country at this university.

GAs provide genetics services to families with genetically determined disorders in whom a diagnosis has been established by an M.D. geneticist. They organize carrier and other testing and provide lifelong follow-up and support. They also provide education throughout their area for the professional and lay public about genetics. The system of five levels of services in our state is illustrated in the figure. This is a dynamic concept of clinical genetics service delivery and reflects the situation in 1984. In 1976, no genetics services existed outside Madison. When local funding becomes available, it will be possible (and that is our dream) to establish level two centers with a local M.D. geneticist, GA, and clinic coordinator in other medical centers around the state (Milwaukee and Marshfield).

If a larger proportion of the 20 percent of the population at risk for genetically determined disorders is to benefit from the dramatic changes occurring in medical genetics today, genetics counselors must reach out to every corner of the state. Rarely has the Wisconsin idea been closer to reality than within the context of clinical genetics as it is practiced here today.

Sledgehammers and restrictive regulations cannot exist within our university boundaries which extend to the borders of our state and beyond.☐

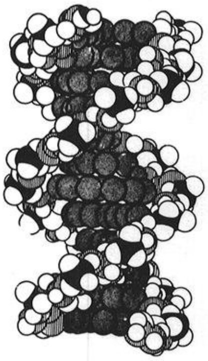
I. ★ Outreach Clinic with no local staff, visiting G.A., M.D., and Madison based coordination
II. ○ Local clinic coordinator, visiting G.A. and M.D. (previously Rockford & LaCrosse), Eau Claire
III. ▲ Center with local G.A., visiting M.D. (LaCrosse, Rockford, Green Bay)
IV. ● Permanent center with M.D., G.A. (Marshfield and Milwaukee X 2)
V. ■ University based center (WCGC, Madison)



GA = Genetics associate
MD = physician
WCGC = Wisconsin Clinical Genetics Center
numbers in each county = # of genetic contacts

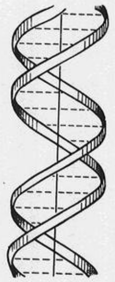
Figure
Types of Clinics Providing Genetics Services in Wisconsin (5 levels)

The Revolution in Genetics



By James F. Crow

University of Wisconsin-Madison



When I was a student in the 1930s, the gene was a black box. Thanks to Gregor Mendel, we knew how genes were transmitted from parent to progeny. Thanks to W. S. Sutton, we knew the genes were associated with chromosomes in the cell nucleus. Thanks to A. H. Sturtevant, we knew how to map the positions of genes along the chromosome. Thanks to Archibald Garrod, and to Wisconsin's Sewall Wright, we knew that genes were responsible for synthesis of protein enzymes. We knew exactly how the gene was inherited, we knew precisely where it was, and we knew what it did; but we had no idea what it was.

H. J. Muller, the idea-man of the first half-century of genetics, pointed out what a gene must be able to do. It must carry information in enormous amounts; for our genes carry the instructions to develop into a person, not a petunia. It must be able to copy itself and to do this, moreover, with surpassing precision; for a human gene can copy itself over and over again for a million years without making a mistake. Even more remarkable, when a gene does make a mistake, it copies the mistake, not what was there in the first place. It is this mistake-copying property, *mutation*, that makes natural selection possible. Muller spoke of the gene as the basis of evolution, and therefore of life. These things we knew. But as to what a gene actually was and how it did these remarkable things, we had not the slightest inkling. Furthermore, I didn't think we had much chance of finding out during my lifetime.

At the turn of the half-century, this all changed abruptly. The breakthrough came about by the convergence of two separate lines of inquiry. One was the study of very small organisms, bacteria and viruses, which are far more revealing of their inner natures than mice and men, or even fruit flies. The second was the study of large molecules—proteins and the incredibly

The stockmarket boom in genetic engineering was premature, but practical results are accelerating.

long and thin DNA. (I could tell you what DNA stands for, but this wouldn't help in the slightest your understanding of its role in heredity.) By the early 1950s most geneticists were convinced that the key lay in the chemistry of DNA. When James Watson and Francis Crick discovered its structure, they closed their 1953 article with a magnificent understatement: "It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material." ("Molecular structure of nucleic acids," *Nature* 171[1953]: 737-38.)

The structure itself almost shouted the answers to Muller's basic questions: how the gene stores information, how it copies itself, and how it mutates. In the simple, double-helical structure geneticists could immediately see the answer to the deepest genetic riddles. Of course all this is now commonplace. Every high school biology student learns the structure of DNA, and every newspaper reader is familiar at least with the term. It is hard to remember what it was like not to know the simple chemical structure that underlies evolution and life.

The ensuing years were times of rapid progress. Molecular biology attracted the brightest young scientists, often seducing them away from chemistry and physics. As more and more of the details were worked out, the initial simplicity gave way to increasing complexity. Not all the rules of gene behavior are as simple as the Watson-Crick picture. But the rate of progress and the depth of understanding were outstanding for any science, and unprecedented in biology.

We have come to expect that when there is a fundamental new scientific insight there will be new and exciting practical applications. Some genetic optimists expected that these would be as important and as revolutionary as the basic insights had been. But this was not to be. To be sure, there were important advances in the practical application of genetics. Many technical improvements sped the development of high-yielding, disease-resistant crop plants. Clever manipulation of chromosomes made better potatoes. Moreover, potatoes can now be grown from seed rather than tubers, and this offers a chance to grow this crop in countries too poor to store seed potatoes and protect them from disease. A combination of breeding and management changed fried chicken from a Sunday luxury to the energetically most efficient kind of meat. Artificial insemination led to a sudden upward bend in the slope of increased milk production in cattle. And human artificial insemination has permitted couples with sterility problems or with fears of inherited defects to have children.

Technical advances brought the possibility of detailed study of human chromosomes and a chemical understanding of many metabolic diseases. Both of these, together with increasing skill and safety in collecting amniotic fluid, brought a capacity to detect many abnormalities in young embryos. For the first time, the possibility of therapeutic abortion means that older mothers need not fear that their children will be chromosomally abnormal. Genetic counselors can talk in terms of certainties rather than probabilities.

The remarkable thing is that most of these advances did not depend, or depended only very indirectly, on fundamental understanding of the gene. The great excitement of molecular genetics was the deep understanding that it provided, not its medical and agricultural benefits. But that is beginning to change, and change rapidly. The most important single discovery that has made possible the direct manipulation of DNA is finding a class of enzymes that cut the DNA molecule at specific places. This permits the experimenter to cut and paste DNA molecules almost at will. We are beginning to see industrial, agricultural, and medical applications that are based on manipulation of the DNA itself.

These are the beginning stages, and the stock market boom in genetic engineering may have been premature, but there is little doubt that practical results will come at an accelerating pace. DNA trickery has made possible the laboratory synthesis of pituitary growth hormone and other chemicals that have traditionally been in short supply. Sickle cell anemia can be discovered early in pregnancy. The gene for Huntington's disease, an inherited condition that causes a physical and mental deterioration in middle adult life, has been isolated. And there are many others. The diseases, however, are individually all rare. DNA trickery has yet to have a substantial impact on the more common diseases.

One area of rapid advance is in the preparation of better and cheaper vaccines. In our cancer-obsessed society we tend to forget that much of the world does not have the luxury of dying of cancer; in less affluent countries people succumb to other things first. Malaria remains a scourge. In the 1950s DDT and other potent insecticides promised to rid the world of this and other insect-borne diseases. For a while, this worked. Fifteen years of spraying in Sri Lanka reduced the incidence of malaria in 1963 to seventeen reported cases. Then came resistant strains of the mosquito, *Anopheles culcifacies*, and five years later the number of cases was more than a million. And of course the indiscriminate use of more and more concentrated insecticides to counter resistant insects brought ecological problems. Not only have mosquitos become resistant to insecticides, but the malaria parasite has become resistant to drugs, so medical treatment is less effective.

Another approach is immunization, but the complexity of the parasite's life cycle makes this difficult. One avenue looks especially promising. Two laboratories have recently isolated the gene that makes the surface protein of the *sporozoite*, the stage of the malaria parasite that the mosquito transmits. It is obviously better to immunize against the initial stage of the infection than against later stages which up to now have been more amenable to study. Developing a sporozoite vaccine isn't easy; it's hard to get enough mosquitos. But now that the relevant gene can be grown in the laboratory, the vaccine can be produced in abundance. It's too early to know whether this will be the humanitarian boon that it promises to be. I doubt that there is any simple, single solution to the malaria problem; but this and other molecular methods should take us a step closer to the elimination of this ancient scourge.

On a more trivial level, a recent *New Yorker* article reports a medical mystery in which a mysterious epidemic of "food poisoning" turned out to be caused by marijuana that had been contaminated by human feces. All the cases were traced to a batch that contained high concentrations of the bacterium salmonella. Epidemiologists were able to identify the specific culprit strain by using the DNA-specific enzymes that I mentioned before.

The question of cancer always comes up. For the first time, I think, genetics can make a really important contribution to deeper understanding. There is now a well-established connection between genetic research, viruses, and cancer. Researchers in many laboratories have identified many genes, some with known normal functions, that can be transformed by a virus into one causing malignancy. A few years ago there was a big push to search for new cancer drugs. This was largely trial and error. It cost a great deal of money and used enormous numbers of mice. I doubt that it was worth it. Why are things better now? Because we have a fundamental understanding. The research can be planned rationally; specific questions can be addressed; experiments don't have to be hit-and-miss.

Suppose science eliminates cancer, or reduces it to very small numbers. If we prevent or cure cancer completely, this will increase average life expectancy by about three years. Let me put this into perspective by another comparison. Women now live about eight years longer than men. The "disease" of maleness reduces the average life expectancy of the population by four years more than cancer does. Surely eliminating this sex difference would have social and humanitarian benefits. Widowhood is not a desired state (and nobody is advocating suttee). Why, then, am I not advocating a crash program of research to increase male longevity? Simply because there are no promising leads. The research funds would be largely wasted. Medical and scientific advances have simply widened the gap, and this will probably continue. I suspect that sex differences in mortality are the result of a long evolutionary past and are not easily changed. I think this is something males will simply have to live with (or rather, not live with).

We can expect general longevity to increase by the continued elimination of causes of early deaths. Lewis Thomas recently wrote: "My guess is that new technologies based on a really deep understanding of disease mechanisms will turn out to be inexpensive relative to the makeshift measures that medicine is obliged to rely on these days." ("Biomedical research and the future of public health," *Health Affairs* 2, No. 4[1983]: 32-40) My guess is different. I think it likely that caring for the diseases of old age will become more expensive rather than less. When we prevent or cure a disease, we often replace a quick early death by a more protracted, more expensive later death. Pneumonia used to be the "old person's friend"; it took people away relatively quickly and painlessly.

We all have to die some time. Our evolutionary history is on the wrong side. Although natural selection has kept people alive and strong during the child-rearing ages, especially women, it has done nothing to increase vigor in old age. We won't live a great deal longer by repairing one defect at a time. The machine wears out in too many different ways.

I think the best guess is that, because of the success of medical research in reducing early causes of death, we shall have more and more people living to become dependents, more and more stretching out of death. The number of people who live out their lives in protracted pain or coma, creating a burden to their relatives and to society will probably increase. It is not at all likely that science will produce a utopia in which people live in health, vigor, and happiness up to the moment of death at, say, age 104.7. If the world birth rate drops, as it must, the proportion of elderly, sick dependents is sure to rise.

Let me end this essay on a personal note. Our advanced civilization has brought many new freedoms. But, among the freedoms that we do *not* have is the freedom to choose the time, place, and manner of our own death. We have no choice as to whether our last days are times of serenity, or times of bitterness and pain for ourselves and hardship for others. I for one would like the freedom to choose the time and manner of my death, when I am still in reasonably good health—and preferably after a happy party with family and friends. ☐

Organ Transplantation in 1984

By Folkert O. Belzer and Hans W. Sollinger
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As long ago as 1945, three young surgeons at the Peter Bent Brigham Hospital in Boston, Charles Hufnagl, Ernest Landsteiner, and David Hume, joined the vessels of a cadaver kidney with the brachial vessels of a young woman who was comatose from acute renal failure due to septicemia. The kidney functioned for several days before it was removed, and the woman regained consciousness. Shortly after this, the woman's own kidneys began to function and she made a full recovery. Now, in 1984, thirty-nine years later, renal transplantation has become an accepted treatment of patients in end-stage renal failure. It is estimated that well over 30,000 kidney transplants have been performed throughout the world. Improving results in renal transplantation has stimulated interest in transplantation of other organs, such as the heart, heart-lung, liver, and the pancreas.

Parallel to these clinical developments, basic research in the fields of immunology and transplantation biology was intensified, resulting in an unexpected extension of knowledge. As Professor Nossal emphasized in his summary of the IX Congress of the Transplantation Society, "Twelve years ago—a very short time in the perspective of man's fight against disease—nothing was known about monoclonal antibodies; there were no suppressor T cells; no recombinant DNA technology; no T-lymphocyte clones. More germane to transplantation as such, we had no Cyclosporine A; no transfusion effect; no D-locus typing; no MHC restriction of T-lymphocyte function and all that flows from that. So the overwhelming impression is one of tremendous growth in knowledge and power of a discipline that has reached full maturity and independence, a future charged with possibilities." Within the limited scope of this article, we will attempt to summarize briefly some of the highlights of the recent developments in transplantation biology and clinical organ transplantation.

Graft rejection and immunosuppression

Despite the ever increasing success of organ transplantation, rejection of the transplanted organ by the recipient still remains the major problem to be overcome. Knowledge of the mechanism by which the tissue allograft is rejected is increasing, and obviously the more precise our knowledge, the more likely we are to develop better methods of monitoring the immune response to an organ graft and to design more specific immunosuppression. The mere response to an allograft is best discussed by separating the efferent response (induction phase desensitization) from the efferent limb of the response, this latter phase being responsible in general for the destruction of the graft. The induction of alloimmunity is initiated by antigen (histocompatibility antigen) presented to helper T cells by antigen presenting cells of the host. The most powerful antigen presenting cells are dendritic cells or macrophages. Interaction between antigen presenting cells and T-helper cells is mediated by histocompatibility antigens. More specifically, the antigen presenting cells of the host must share the same class of antigens with the T-helper cell for the antigen to be recognized. Once the T-helper cell is triggered, it produces a number of lymphokines, such as intraleukin 2, which is necessary for the maturation of cytotoxic T cells, T-helper cell factors which trigger the B cells to produce antibodies, and macrophage activating factors. In an unmodified host this process will result in graft rejection and graft loss within ten to twenty days after transplantation.

In an attempt to dampen the host response and to avoid graft rejection, immunosuppressive therapy has to be initiated at the time of transplantation and usually has to be continued for the time of graft function. Standard immunosuppressive therapy consists of corticosteroids (Prednisone) and azathioprine, one of a group of drugs known collectively as thiopurines. The complex biochemical effects of azathioprine are not completely understood. It can inhibit both DNA and RNA synthesis. Azathioprine effects the inflammatory reaction, as well as both cell mediated and humoral immunity. Corticosteroids effect the immune response in innumerable ways, especially in high doses, and they particularly effect T lymphocytes. It is thought that in particular a powerful anti-inflammatory action plays an important role. This becomes evident in the treatment of rejection episodes when high doses of prednisolone or methylprednisolone exhibit clinical improvement within one to two hours. The combination of corticosteroids and azathioprine is being considered as the gold standard of immunosuppressive therapy. More recently, most transplant centers have added anti-lymphocyte globulin preparations and Cyclosporine A to their immunosuppressive armamentarium. Anti-lymphocyte antiserum can be obtained by hyperimmunizing horses, rabbits, or goats with human lymphoblasts, thymocytes, or thoracic duct lymphocytes. Considerable debate persists regarding the mechanism by which antilymphocyte sera prolong graft survival. It is certain that the effects cannot only be explained by the reduction of lymphocytes in the peripheral blood, and it has been suggested that the generation of nonspecific suppressor T-cells is enhanced by administering antilymphocyte serum. Currently antilymphocyte sera are used either prophylactically within the first fourteen days after transplantation or for the treatment of rejection episodes.

In 1978, Calne from Cambridge began a trial using a new drug isolated from two strains of fungi imperfecti. In Calne's experience as well as in multicenter trials in Europe and the United States, the use of Cyclosporine A improved cadaver graft survival by 15 to 20 percent. More recently, Starzl in Pittsburgh demonstrated that the combined use of low doses of Prednisone and Cyclosporine represents the most beneficial immunosuppressive combination currently available. It has been postulated that the predominant effect of Cyclosporine A is directed at T lymphocytes at an early stage of the induction of the immune response. Much of this activity is related to the inhibition of the production of lymphokines, such as IL-2, thus preventing Il-2 to induce proliferation of cytotoxic T-cell precursors. While Prednisone, Imuran, ATG, and Cyclosporine A have a generalized suppressive effect on the immune system, monoclonal antibodies against T cell subsets have recently been tested in multicenter trials. OKT-3 and OKT-12 are examples of such monoclonal antibodies which are directed predominantly against helper T cells. It seems that these antibodies exert more selective action on immunocompetent cells; however, their immunosuppressive potency does not seem to exceed the immunosuppressive effect of polyclonal sera such as ATG and ALG. The major disadvantage of the monoclonal antisera is that they are of mouse origin and humans treated with this antisera became rapidly sensitized so that these sera may not only cause anaphylactic reaction but also lose the immunosuppressive potency. Nevertheless, there is justified hope that more potent monoclonals of human origin will be developed in the near future.

Kidney transplantation

Kidney transplantation, now in its fourth decade, is an established and very effective treatment for patients with end-stage renal disease. Dialysis backup treatment gives kidney transplantation a very important advantage over other types of organ transplantation. We feel that kidney transplantation is the treatment of choice for patients with kidney failure because it offers them the best chance for optimal medical, psychological, social, and vocational rehabilitation. Patients who opt for transplantation do so because they believe that the less restricted lifestyle is worth the risk of major surgery and lifelong immunosuppressive therapy. Approximately 5,500 kidney transplants are done annually in over 100 medical centers in the United States.

Unlike most other kinds of transplants the kidney donor can be a living relative because the kidneys are paired organs and the donor can live a perfectly normal healthy life with only one kidney. The results for renal transplantation are continuously improving with more than 90 percent one year graft survival for living related transplants and 75-85 percent one year graft survival for cadaveric transplants. There is still controversy on the importance of tissue matching in cadaver renal transplantation. It is well accepted that in living related transplantation, the results are better in completely HLA matched donor-recipient combinations. The degree of matching seems to be less important in cadaver transplantation. Probably the single most important factor in determining the outcome of cadaver renal transplantation is whether the recipient received preoperative blood transfusions. There is good evidence that patients receiving three to five or more random blood transfusions prior to transplantation enjoy a 15 to 20 percent better chance of long-term graft function. In our own center, we require all potential cadaver transplant recipients to have five random blood transfusions prior to transplantation. Less emphasis is placed on HLA A, B, C, and DR typing; however, we insist on an historically negative crossmatch, and, of course, the ABO barrier cannot be violated. The management of patients after surgery focuses on rejection and treatments of the various causes of graft loss, morbidity, and mortality. Since most problems arise in the early weeks after transplantation, patients must be very closely followed during this time. By six to twelve months after the transplants, grafts that will fail have usually done so and those that are functioning usually continue to do so with serious complications unusual.

We can conclude that with the increasing rates of graft survival, decreased morbidity and mortality, kidney transplantation can be offered as the first choice of therapy to most patients in end-stage renal failure. The only absolute contraindications to renal transplantation are (a) limited life expectancy for a reason other than kidney failure (for example, widespread cancer), (b) serious conditions that preclude safe major surgery, general anesthesia, or immunosuppression (for example, severe chronic lung disease or severe coronary artery disease), and (c) any condition that removes the probability of successful transplantation (such as noncompliance due to alcoholism).

Liver transplantation

In 1963, Starzl performed the first orthotopic liver transplant in man.

Since then approximately 600 liver transplants have been performed worldwide. The most extensive experience of liver grafting is the series of Starzl in Pittsburgh. Some of his patients have enjoyed prolonged rehabilitation, several surviving more than fifteen years. Liver transplantation is the technically and organizationally most demanding transplant procedure. Two separate teams—one responsible for harvesting the donor organ and one recipient team—are involved in the procedure. Since the liver cannot be safely preserved for more than ten hours, the recipient operation and the donor operation have to be started simultaneously. It is not unusual for a liver transplant to last between twelve and twenty-four hours. The blood loss averages fifty to eighty units, and large amounts of platelets and plasma have to be administered to assure hemostasis. With the recent introduction of venovenous bypass, blood loss can be significantly reduced. Recently a liver transplant program was started at the University of Wisconsin Hospital in Madison. Two patients who received new livers are alive and doing well at the time of writing. Starzl's series show 75 percent one year graft survival, which he attributes to the use of Cyclosporine A. The most common indications for liver transplantation are biliary atresia and cirrhosis of various etiologies. It has been estimated that in the United States approximately 2,000 patients per year are candidates for a liver transplant.

Heart transplantation

Christiaan Barnard in 1967 performed the first clinical heart transplant. The Stanford group headed by Norman Shumway has been the main contributor to the development of successful heart transplantation since then. Currently, the International Heart Transplant Registry shows more than 1,000 cardiac transplants performed, with the prospect for one year survival at least 70 percent in the leading centers. Much of the recent improvement in graft survival is attributed to the introduction of Cyclosporine A. Also since Cyclosporine A has been used, hospital costs have been essentially cut in half due to the reduced length of hospitalization.

Heart transplantation can be performed either in the heterotopic (piggyback heart) or orthotopic position. Heterotopic position is only indicated if the recipient has severe pulmonary hypertension. The introduction of a percutaneous transvenous endomyocardial biopsy by Caves has been the major step forward in the diagnosis of rejection crisis. In particular, with the advent of Cyclosporine, Caves's discovery appears to be even more crucial, thence the electrocardiographic changes provoked by acute homograft rejections are not seen. There is little edema of the myocardium so that QRS voltage deviations are rarely observed even in the presence of a moderately advanced rejection. The Stanford group has now performed twenty-five clinical heart and lung transplants. Amazingly, more than 50 percent of these patients are professionally rehabilitated. Most patients qualifying for a heart-lung transplant are patients with end-stage pulmonary hypertension. The major problem for combined clinical heart and lung transplantation is the scarcity of suitable donors.

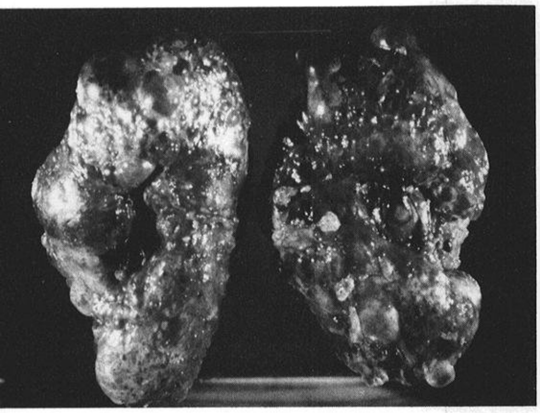
Pancreas transplantation

The first pancreas transplant was performed in December of 1966 by Kelly and Lillyhe in Minneapolis. Since then 450 pancreas transplants have been performed with one year graft survival averaging approximately 20 percent. These somewhat discouraging results can be attributed to five major problems: (1) rejection, (2) technical difficulties in draining exocrine secretions, (3) early vascular occlusion, (4) pancreatitis, and (5) difficulties in making the diagnosis of rejection. With twenty-one pancreas transplants performed our group at the University of Wisconsin Hospital in Madison has the second largest experience in the United States. Several technical modifications developed by our group such as draining the exocrine secretions into the urinary bladder and the simultaneous transplantation of the spleen have increased the success rate of pancreatic transplantation. We have followed a patient for two years after transplantation who has perfect blood glucose control and whose secondary diabetic lesions such as neuropathy and retinopathy have stabilized and improved. We are currently considering patients as candidates for pancreas transplants if they have received a previous successful kidney transplant. Once the technical problems in pancreas transplantation have been resolved, we will offer this procedure to patients prior to the development of end-stage complications. We have little doubt that the results of pancreas transplantation will equal the results of renal transplantation in the very near future.

Future transplants

In this decade we expect to achieve major advances in organ transplantation. We predict that cadaver graft survival will reach the 90 percent mark before the end of the century. In our own transplant center, one year graft survival in 129 consecutively performed cadaveric transplants is already 85 percent. The work done in the immunologic laboratories since the initial work by Medawar more than forty years ago will be reflected in improved results on the clinical wards. More prerequisite, however, will be that transplant surgeons directly involved in the care of patients continue to communicate and attract basic scientists in order to narrow the gap between fundamental immunology and applied clinical transplantation. In addition, transplant surgeons must understand immunologic principles and continue in the tradition of pioneering individuals in this field. As Sir Peter Medawar noted many years ago, "one of the remarkable features of transplantation research has been the recruitment of practicing surgeons into the laboratory, and the width and depth of contributions they have made to the theoretical foundations of transplantation research."☐

These are my kidneys. The translucent bumps are cysts. Their total weight was 7.56 lbs. I carry a print of this pathology lab slide to remind me that things were once much worse.



View from the Inside Out

By Bernice Durand © 1984
University of Wisconsin-Madison

In the spring of 1960, I was a seventeen-year-old freshman at Radcliffe College. I was researching a term paper in the Harvard Law Library and stopped to go to the dorm for dinner. I started up on my bicycle with its basket loaded with books and was suddenly pitched over the handlebars, landing on my chin and left elbow. The loose strut from the basket had caught in the front spokes. The bike wheel was a mess and I felt shaky, so I walked the bike a mile back to the dorm. I felt an urgency to urinate. I glanced into the toilet before I flushed it. It was filled with blood.

I packed my overnight bag and asked the housemother to call a taxi and the infirmary. She did so reluctantly, assuring me that I had probably just precipitated my period.

The old taxi had no springs. As I bounced toward the infirmary, I could feel myself slipping away. When I reported to the nurse on duty, she assured me that I had probably just precipitated my period, but assigned me a bed.

I was thirsty, faint, and getting rather irritated by the casual reactions. I asked her for water and a bedpan. I produced several cups of blood. Soon I was in an ambulance, in a state of semi-shock, headed for three weeks in Peter Bent Brigham Hospital, where I lay flat on my back and drank a lot of water.

The doctors told me that my right kidney had been ruptured, no doubt by the handlebar. They told my grandfather, an Iowa doctor, that I had polycystic kidneys. Because my mother was dying of cancer, the doctors in Boston and Iowa decided not to worry my parents with the kidney disease. They also decided that I was too young to be told. My grandfather died soon after my mother, taking the secret with him.

Although I asked the Boston doctors many times how a handlebar hitting the front of me could possibly damage a kidney up in the back of me, I never got a straight answer. I was assured when I was discharged from the hospital that my kidneys were just fine—the function was normal (true), but there was some "cosmetic damage" (a gross understatement).

The disease started in 1960 to turn my life inside out. It caused confusion, pain, and frustration, and a sort of old age before I finished being young.

Rediagnosis

For a decade thereafter, living far away from Boston, I had false appendicitis, false ruptured ovarian cysts, false colitis, and either false or stupid doctors. My waist, already too big proportionately for my body by junior high school, grew. I had traveling lumps and pains. When one doctor did note that my right kidney was in a funny place and that my blood pressure was too high, I explained that the kidney location was due to the bicycle accident and the blood pressure due to graduate school. He looked skeptical but did not follow through.

Then, when I was twenty-seven, ten years after the Boston accident, I had my first experience with "gross painless hematuria," that is, much blood in the urine with neither pain nor infection. This time when they figured it out, they told *me*.

It was irresponsible that I was not told when I was seventeen, because pregnancy would have endangered my life, and the Boston doctors knew that I had a 50 percent chance of producing a baby with the same disease. Fortunately I did not choose to be a mother. When my kidneys were not actively bothering me, I am sure I was happier not knowing.

Mutation

My disorder is a cystic disease of the endocrine system, a genetic dominant condition called polycystic kidney disease, because its principal target is the kidneys. Because the disease had never appeared on either side of my family, we know that I am a mutation. About 5 percent of us with this disease are "new expressions," so it must be an easy change to come by.

Pain

Polycystic kidneys can cause debilitating pain if an exterior cyst ruptures and drains into the abdominal cavity. When internal cysts burst, they just drain into the bladder and do not hurt.

My worst experience with a ruptured cyst occurred during my decade of medical ignorance. I was sitting on the sofa with friends when a sharp little pain near my waist was followed by intense pain about the rectum, a subject I didn't think I should introduce into the conversation.

I stood up because it hurt so much to sit, and the world went black, though I did not faint. Soon I was lying on the kitchen floor, getting very cold, and people looked and sounded very far away. If I lifted my head, the world went black again, and the pain was so intense that I could breathe only shallowly. I concluded I was going into shock, asked for my coat to keep warm, and had them dial my doctor. I managed to tell the doctor quite matter-of-factly the details of my situation. He actually said it: "Take two aspirins and call me tomorrow if you still feel bad."

After a long, scary evening I finally had a friend take me to the emergency room. My doctor was there, having just delivered a baby. He looked at me and wanted to do immediate surgery. His instant diagnosis was a large ruptured ovarian cyst. Since his earlier prescription of aspirins had cured me of trusting him, I told him I was willing to give my body a chance to reabsorb the fluid from the cyst by itself.

I luckily never did need surgery for that or any other ruptured cyst. But a three-day stay in the hospital with all conceivable tests failed to alter the diagnosis of ovarian cyst. Since my mother's cancer originated as an ovarian cyst, this sounded plausible—except for the initial pain at waist level. They couldn't explain that.

I learned then that when any cyst ruptures, the fluid naturally collects in the lowest spot, and moving just shifts the pressure and the pain. I counted it a miracle that I never had a cyst rupture while I was giving a lecture, although several times they popped as I was walking down the hall at the university, and I would rush in a strange gait to my office to recover.

Duplicity

To tell or not to tell is a question which faces the chronically ill person. I have tried both. If I tell you, you pity me; you cannot help thinking I am somehow unwhole. If I do not tell you, you mistake the weaknesses brought on by my disease for intrinsic shortcomings. Our emotional response to disease lags behind our medicine. I am damned either way, and a social dilemma is added to my other worries. I chose in almost all cases not to tell. I thought it would sound too melodramatic.

One example of covering up was when in mid-December, 1980, my stepson graduated from the University of Wisconsin. We went to commencement at the field house, parking about five blocks away. In kidney failure the extra proteins produced by muscle movement cause nausea. I reswallowed my breakfast three times while we walked to the ceremony. Nonetheless, I look suitably cheery in the photographs with the new graduate.

Later we had a dinner party for my stepson, his fiancée, and her parents. With help I had put together a meal of roast beef, baked potatoes, salad, and pie. It had taken me the whole previous evening and about two hours that day to prepare that meal. The same simple menu took even longer to prepare for guests on Christmas Day. I am sure no one at either dinner suspected the effort it had taken me to bake potatoes.

Many people thought my illness began in late December, 1980, when I finally hit bottom and told them. This was the month when I had wrist surgery to prepare for dialysis, and my brother and I began tissue matching for a transplant. And many thought its effects all ended six months later when I received my transplant, unaware of the long slide down and climb back up.

Dialysis

The main criterion for starting dialysis is the level of the protein Creatinine in the bloodstream. Renal failure toxicity is not well understood and is too complex to measure by any one chemical. Creatinine is a by-product of normal muscle metabolism and has been chosen as the standard of renal function: bad kidneys put less of it into the urine and leave more in the blood. The standard for starting dialysis is an amount of Creatinine in the blood accepted as representing 10 percent function. (One hundred percent function can be maintained by less than one healthy kidney. The normal level of Creatinine in the blood ranges over a factor of almost two.)

To illustrate the variability which is not taken into account by this standard, in late 1980 when I had "25 percent" function, my physical and mental poisoning were such that walking up a flight of stairs would make me vomit from the extra use of muscles and I could not understand my lecture notes I'd prepared the night before. During the sixteen days in June when I had *no* kidneys, my Creatinine dipped to the "8 percent" level, finally qualifying me for the dialysis I had had for three months.

The machine

I liked dialysis when I was finally allowed to start it in February, 1981.

This is one of the dialysis machines I used, which I understood as intimately as most of us understand any parts of our bodies.

I am standing outside the UW Hospital, on one of my daily long walks, six days after the transplant. I am unknowingly displaying for the last time my long, thick, straight hair. (right) About two thirds of my hair fell out due to the large initial dose of Prednisone, a corticosteroid, at the time of my transplant. It all grew back in tight curls, quite startling to us.

The first time I dialysed, I came home with a swollen, blue left arm from the needles and a splitting headache from the "brain drain." The last thing to come to equilibrium with the cleansed blood is the brain. Our gray matter has no blood circulation and communicates with the blood via the cerebrospinal fluid. As it slowly gives up its poisons, water invades the brain and swells it, causing a bad headache. This phenomenon is known to all dialysers, and I soon learned from a pro to eat hard candies during dialysis and drink corn syrup afterwards. The extra blood sugar helps by changing the osmotic pressure in the area of the brain. But the first time, not having been prepared for the headache, I took some pain killers, wrapped my arm in an icebag, and collapsed onto my bed, propped up by pillows, expecting to pass out. By then I never could stay awake many hours, and this had been an exhausting day. My briefcase was on the bed beside me, filled with ungraded homework and rough lecture notes. I opened it and made the token gesture of looking at a homework paper. Seven hours later, having stopped only to eat supper, I got tired and went to sleep.

Though the needles used for dialysis struck me initally as misplaced horse needles, I soon learned to put them in myself. My husband learned to be my partner in case we had to continue dialysis at home instead of getting the planned June transplant. Because my brother and I were not a great match, we were going through a long, chancy transfusion protocol to desensitize me to his tissue. We knew that we would not learn until late afternoon on the very day before the scheduled transplant whether the transplant would proceed. If it did not, we would install a home dialysis machine and go on the waiting list for a cadaver kidney.

Rip van Winkle

I will tell you how it felt to wake up after the transplant, after a ten-year nap. Sixteen days earlier, in a four-hour surgery, my kidneys and spleen had been removed by Dr. Belzer. (I lost seven inches from my waist, giving me a female shape for the first time.) We had planned the two-week interlude for me to recover from this first surgery, which went well but made me feel as if I had now been physically turned inside out.

In a four-hour pair of surgeries on Wednesday morning, June 17, my brother's left kidney was removed, carried into the next room, and put into my lower right abdomen, between the pelvic bone and the bladder, neatly connected to the aorta.

My brother's surgery was started before mine. When he was safely open, I was told that the operation next door was proceeding smoothly, then anesthetized. When he was stapled shut, I was still having my new kidney stitched in place. When I was coming up out of the fog in the recovery room, he was being wheeled back to his own room. He asked the attendants to wheel him next to me and said, "Hi, boss." I think I said thank you before I drifted off again.

I was moved to the intensive care unit in midafternoon with liters of urine pouring into my bag every hour as the new kidney attacked several years' accumulation of poisons, plus pounds of stored fluids. When I next awakened around five, the experience was so exciting that I did not sleep again until the next afternoon. A heavy curtain which had hung across my brain for years had parted and was being dissolved at an unbelievable rate. The healthy kidney brought me back to a completely normal blood chemistry in forty-eight hours, literally taking my body back ten years, and the curtain never returned. There had been glimpses of this on dialysis, but nothing to compare with the transplant.

It was very much like the first time I wore glasses and saw individual leaves on distant trees and more than the few brightest stars. I had thought that distant objects were supposed to blur, like impressionist paintings.

The focusing of my mind, which I stayed awake to watch, was exhilarating. I could grab an idea and hold on. This was the first of many revelations about the difference between health and illness, which still occur more than three years later.

Anger

After my recovery I realized that nearly all of my old angers and resentments had dissolved along with the velvet curtain in my head. They must have been substitutes for being angry with my disease. Anger, a natural reaction when one is threatened, was pointless. It could not usefully be directed at anyone or anything. It was an outlet denied to me, or to any "chronic."

Chronically ill patients tend to be self-absorbed because we hurt or are disabled. We feel out of control of our situation and change our habits to try to maintain control. For example, I shifted to the easier tasks which go with being on the faculty, namely teaching and committee work, because my mind was not clear enough to feel under control when I tried to do physics research. I would have good insights and ideas, then be frightened and frustrated when I lacked the clarity to follow through. Nobody had told me that concentration and memory are affected by renal failure, so I would be angry with myself when I fell asleep over my work.

Vitality

A few days after the transplant, it dawned on me that the competent nurses I had admired for their extra energy were normal, healthy people. As my own vitality increased, I realized how much my personality had been defined by my disease. This time my life was being turned right side out.

I sought out a physical therapist and cardiac rehabilitation team for advice on building up my shockingly wasted body. I asked the dietician for a diet compatible with my immunosuppressant medications (no salt, for example). For months I was enthralled by the dramatic change in my physical capabilities. The routine exercises were eventually replaced by skiing, biking, splitting wood, learning to play volleyball.

The same sort of change took place mentally. I needed new work habits to direct the vigor which had been smothered for so long. Also every domestic routine my husband and I had developed had to be changed. I needed to prove I could do everything before I let him do anything.

A psychiatrist who had helped me get onto dialysis and through the spring now helped us learn to be well. Together the three of us worked out an analogy to grief. The disease which had dominated our lives disappeared in a morning. There would be stages of recovering from this loss, peculiar though it may sound to refer to getting well as a loss.

The healing still goes on. In every facet of my life I have had to look for new natural boundaries. I think I know how strong I can be after three years of working hard to be physically fit, but in no other department do I yet know the full range of my possibilities. From needing twelve or more hours of sleep each day, I now need only six or seven. Even eighteen hours a day, totally filled, have not pushed at my emotional or intellectual boundaries.

Spare parts

Redundancy is a characteristic of the human body. We can lose a long section of gut, a lung, a chunk of liver, an eye, or a foot with no unbearable handicaps. But the kidneys seem to be the most overdesigned parts we have. It takes only about six-tenths of a kidney to keep our blood normally filtered. We can certainly live a vigorous life with only one: my brother and I are both professors; he competes in triathlons and I ski down "black diamond" (most difficult) trails in the Rockies.

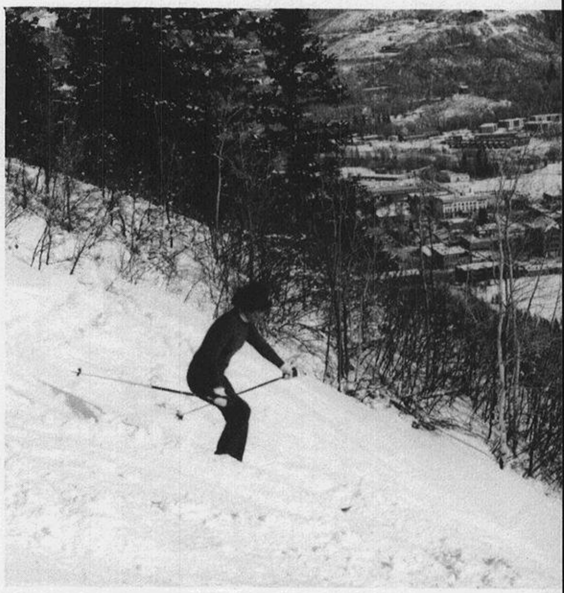
Two eyes give us depth perception. Two ears give us directional hearing. Two feet give us stability and mobility. Most of us would not agree to give up an eye, ear, or limb to a relative or friend, even though we could manage with only one, but most people would give up a kidney.

While I know of no natural reason to have two kidneys, a manmade reason is to give one away. My own two kidneys gave me twenty-one years of pain and confusion; my brother's two kidneys gave me the chance to start a normal healthly life at age thirty-eight.

The cost

Now many patients receive their transplants without first going through dialysis, while they still have a fairly high percentage function. They recover quickly and are less likely to have developed a dependent or defeatist attitude while ill. Most are back at work or never stopped working, while many until recently had to go on disability insurance payments, and some even felt that society *owed* them a perpetual living, as well as a life.

Bernice Durand



Is the high cost of kidney transplants worthwhile to the taxpayer? My answer is yes. I never ceased to be a taxpayer, and I am certainly a more productive citizen now than while I was ill. The cost effectiveness in cold economic terms of early transplantation—ever more successful—is clear today.

As more spare parts become available to us, we repeatedly face this issue. Not all organs respond to current techniques of surgery and immunosuppression as well as kidneys. Perhaps in another ten years hearts, livers, and pancreases will be as cheap and effective, but not unless we keep trying. For example, a diabetic with a pancreas transplant would not have to face blindness and heart and kidney failure.

Pound of flesh

Much of this article is taken from a diary I have kept since December 1980, writing down events I don't want to forget. I hope to publish a longer version, but for this brief article the editor and I have chosen stories which I hope convey some of the contrasts I found between being sick and being well. Had I been born a generation earlier, I would be dead by this age. Society, medical science, my brother lent me a pound of flesh. I believe I should pay back a pound of gold.□

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Progress in Cancer Treatment

**By Paul P. Carbone
Director, Wisconsin Clinical Cancer Center**

Recent progress in understanding and treating cancer is generating excitement in laboratories and clinics in Wisconsin and around the country. Many cancers now have significantly different outlooks than they did just a few years ago.

Currently over 45 percent of cancer patients are considered cured, meaning they survive five years without new signs of cancer and have life expectancies consistent with their age groups. However, the challenge in arresting cancer is great because of the nature of the disease.

The term cancer refers to a group of over 100 diseases with widely varying characteristics. By the time cancer symptoms appear, the disease has often spread extensively throughout the body, limiting the effectiveness of treatments and the likelihood of cure.

Cancer treatment relies primarily on surgery and radiotherapy to battle locally confined cancer and drugs, or chemotherapy, to destroy cancer cells which have migrated away from the original site. The success of treatment hinges on the ability to destroy cancer cells while doing the least amount of damage to adjacent normal cells. The sometimes serious side effects of this process are a large part of what frightens people about cancer, yet physicians are very careful about balancing the short-term damage to some normal cells against the potential for cure or an improved quality of life for cancer patients.

So, where do we stand with cancer in 1984? The disease will strike approximately 870,000 Americans this year, excluding cancers of the skin and cervix. In Wisconsin alone, 18,000 residents will hear a diagnosis of cancer. This article will provide snapshots of progress in cancer, especially over the last decade. (Table 1)

TABLE 1
Estimated Cancer Deaths: USA and Wisconsin 1984

Site	*USA*	*Wisconsin*
All Sites	450,000	9,200
Colon and Rectum	59,000	900
Breast	37,700	900
Lung	121,000	2,100
Uterus	9,700	175
Prostate	25,000	600
Leukemia	17,000	375
Pancreas	23,000	475
Stomach	14,000	325
Oral	9,000	175

Table 1 - summarizes incidence and mortality for the common cancers.

The incidence of certain cancers has changed over the last fifty years. Most important to mention are the data for lung cancer, gastric cancer, and cervical cancer.

Lung cancer was a relatively uncommon form of cancer in the 1920s and 1930s. In the 1980s lung cancer is clearly the most common killer, responsible for more than 100,000 deaths per year. In women, lung cancer will soon be the most common cause of cancer deaths, outrunning breast cancer. All this can be attributed to the increase in smoking of tobacco.

Gastric cancer was the most common cause of cancer deaths in the 1920s. Over the next fifty years the deaths due to gastric cancer have decreased markedly. As far as we know, this change has occurred without a corresponding improvement in early diagnosis or better treatment. The effect has been attributed to changes in dietary habits, namely a decrease in the intake of smoked foods and an increase in the use of fresh foods and dairy products.

Cervical cancer deaths in the USA are relatively uncommon in the 1980s. The marked change from the past has occurred in part because of more effective methods of diagnosis: the Pap test and the colposcope, the latter developed and used widely in Wisconsin. Most other cancer death rates have not changed significantly. The increased overall mortality is due to tobacco-related cancers that keep the overall death rate unchanged. Significant progress in clinical treatment has occurred in Hodgkin's disease, breast cancer, testicular cancer, acute leukemia, and childhood cancers.

Hodgkin's disease

Hodgkin's disease is a cancer of the lymph nodes, which normally serve as the natural defense against infections. Symptoms include swelling of the glands in the neck or inside the chest and abdomen. The patients often have fever, weight loss, or night sweats. Characteristically, young adults are afflicted. The diagnosis must be established with a biopsy. In the past the disease was only curable in about 25 percent of patients. Modern approaches to better definition of the extent of disease with special scans and biopsies have led to a better understanding of the disease and its treatment. Radical radiation therapy has definitely increased the cure rate. However, in the past patients with extensive disease were rarely cured.

TABLE 2
Hodgkin's Disease Therapy Results

Stage	Incidence %	Potential Cure Rate %
IA	10	95
IIA	30	85
IIIA	25	75
IB-IIB	10	70
IIIB	15	60
IV A+B	10	50

Beginning in the 1960s and coming to fruition in the 1970s was the discovery of the combination of drugs known as MOPP, effective in 80 percent of the cases. In the first cases treated with the combination at the National Institutes of Health, the majority were followed for ten years and longer without recurrences. After these initial results were published in the early 1970s, others followed suit and confirmed these results.

The latest results are summarized by stage in Table 2. As the table indicates, one can anticipate an overall 90 percent cure rate if the appropriate evaluation and treatments are applied. In studies developed at the University of Wisconsin, based on information from other cancer centers, a group of patients with advanced disease was treated with chemotherapy for nine months and 92 percent are alive at seven years following treatment. These results are extremely exciting considering the almost universal fatality for similar patients treated in the past.

Breast cancer

Cancer of the female breast is the most common cancer and the most frequent cause of death in women between the ages of thirty-five and fifty-five. Worldwide it is a major problem. The disease tends to occur in women who have relatively few children and have them late in life. It tends to be more common in white middle- and upper-class women.

The disease shows up most often as a lump in the breast, detected by the patient herself or a physician, or by mammography. The diagnosis is established by biopsy. In the past the biopsy and the primary treatment were done at the same time. Now the concept of a two-stage procedure where the biopsy and the surgical treatment are done at two separate times is most acceptable. This allows more realistic discussion about available treatment options. It also avoids the emotional fear that every lump is cancer and automatically results in mastectomy.

More recently at the UW-Madison and other centers more women are electing to undergo an excisional biopsy where only a small piece of the breast is removed and treatment is completed with radiation. This results in a normal appearing breast with a similar survival outcome as more radical surgery.

Breast cancer is considered to be a hormone-dependent disease. Many cancers are stimulated to grow by the normal female hormones. In the past, treatment often involved removal of the ovaries, pituitary, or adrenal glands, which are sites of female hormone production. These procedures, in about 30 percent of women, resulted in temporary decrease in the size of tumors. In the past ten years scientists at the UW have been able to use a laboratory test to decide which patient is likely to respond, thereby avoiding unnecessary surgery and increasing the probability of response to 60 percent.

This test is based on laboratory research originally done at the UW in the McArdle Labs as well as the school of agriculture. The UW Wisconsin Clinical Cancer Center (WCCC) provides this service to women in the state through its estrogen receptor lab, set up to receive specimens from physicians throughout the state. Based on tests originally done in England by Craig Jordan, now of UW-Madison, a drug known as Tamoxifen can effectively block the action of female hormones in the breast cancer cell, thereby avoiding completely the need for surgical removal of these glands. The WCCC has been a leader in the testing and use of this drug treatment.

In general the cause of death in breast cancer is the spread of cancer cells throughout the body by the time the original surgery is done. Over the years physicians have determined that the chances of cancer returning can be high if the tumor cells have spread to the lymph nodes in the armpit, which are removed and examined at the time of primary surgery.

In the past ten years several clinical studies, some of them directed from the UW, have shown that by adding anticancer drugs after surgery the recurrence of cancer can be delayed. This now has become standard practice in certain groups of patients.

The rather dramatic benefit with the drug Tamoxifen in prolonging the disease-free interval has been confirmed by studies from the UW, and new trials are underway that will test the possibility of added benefit of long-term use of Tamoxifen in preventing cancer.

Testicular cancer

Testicular cancer occurs predominantly in young men. The most common symptom is enlargement of one testicle. Diagnosis is established with biopsy. As with other cancers there are several subtypes associated with this disease. One of the major and most aggressive subtypes is called taratocarcinoma. The disease spreads very early in its clinical course. Over the past fifteen years the cure rate has risen dramatically from 10 percent to 90 percent, primarily through introduction of several new drugs. The treatment programs have been refined and improved at several centers including the UW. The success of the current drug regimen is such that we feel comfortable recommending less drastic surgery and delaying chemotherapy until and if the disease recurs without sacrificing the opportunity for cure. Less debilitating surgery and the lack of chemotherapy allows these young men to live normal lives, including having children.

Acute leukemia

This term applies to a spectrum of diseases that represents major differences in prognosis and curability. There have been at least three major advances in the past fifteen years.

First, in children, acute lymphatic leukemia was a major killer. Once the diagnosis was established, the patient, usually a three-year-old, was destined to die in three months. This dire prognosis has gradually improved. The average leukemic child can now be expected to be cured and lead a normal life. This progress has been achieved through careful sequential investigations in the clinic and the laboratory as a result of a better understanding of the disease.

A second, less dramatic improvement has occurred in the treatment of adult leukemia. The mortality of this affliction has changed less, but the chances of living a normal existence have improved and for some patients this has resulted in a normal life span. New drugs, all discovered in the past ten years, have made the difference.

A third major advance in this area is the use of bone marrow transplantation to replace the sick, cancer-containing marrow of the leukemic patient with normal blood cells from a relative. While the mechanics of transfusion are not difficult, the hurdles of rejection, dangers of infection, and damage to other tissues by the foreign donor cells were formidable. These barriers have been overcome, and the technique has improved considerably so that nonmatched, related donors can be used. This has made bone marrow transplant more widely available. This work and similar research being done at the UW by Paul Sondel and his colleagues in pediatrics and hematology are attempting to provide the benefit of bone marrow transplantation and the antitumor effect by transfusion of the active lymphocytes alone. These researchers are working to make the procedure safer and even more widely applicable.

Pediatric cancers

A great deal of progress has been made in the treatment of childhood cancers. These cancers affect children in their formative periods and attack the kidneys, muscles, bones, and brain. The treatment results are spectacular with the likelihood of cure rising to 90 percent or more in some cancers. Table 3 summarizes some of the possible outcomes.

Colon cancers

Colon cancer is still a major killer that affects both men and women. The tumor starts as a small growth

TABLE 3
Success Rates in Childhood Cancers

	Percent 2 Year Survival		
Site	1950	1970	1980
Acute Leukemia	10%	70%	93%
Wilms	10%	50%	90%
Neuroblastoma	5%	20%	22%
Brain Tumors	5%	21%	25%
Hodgkin's	20%	60%	85%
Bone Cancer	4%	5%	60%
Non-Hodgkin's Lymphoma	10%	15%	70%

in the intestine that causes relatively few problems until it reaches a size that causes bleeding, blockage of the bowel, or anemia. Primary treatment is surgical removal of the colon. Unfortunately if surgical cure is not possible, the ability to control the cancer is very small with any drug or x-ray treatment.

Two important aspects of treatment for colon cancer were developed at the UW. The major drug that has any benefit was originally developed and tested at the UW in the 1960s. The drug 5-FU causes some of the tumors to shrink and can result in increased survival. Another important aspect of treatment of this cancer is that the disease involves the liver. This serious complication responds to the direct installation of 5-FU or its derivatives into the arteries supplying the tumor. The original technique was perfected and used extensively at the UW. At present we have a better way of injecting the drug into the liver. This technique requires additional surgery, but as a result the patient can lead a more normal life and only return to the hospital for infrequent refills.

Lung cancer

Nothing optimistic can be said about this cancer. In most cases it is a disease caused by the patient, by smoking tobacco. It is a killer that strikes over 100,000 people a year. We could make a major impact against this cancer by altering our habits and encouraging others to stop smoking. The American Cancer Society has made elimination of smoking its major goal. We should support that effort.

Prostate cancer

This disease strikes large numbers of older men. While the cancer causes much pain and affliction, it can be controlled by a variety of ways including surgery, radiotheraphy, and endocrine therapy. Very recently we have seen that the disease can be treated with radiation therapy without damage to sexual function. New drug approaches promise to control the disease.

New treatments

The excitement of the past ten years will be matched in the next ten by new ways of diagnosing and treating cancer. The possibility of vaccines against some cancers now are being tested. In particular an approach to preventing liver cancer by a hepatitis vaccine is underway. Likewise there are very specific antibodies to cancer that seem to contain and destroy cancer cells.

Two new areas of research being tested at the UW deserve special mention. The first is hyperthermia. High fevers in cancer patients have occasionally resulted in the sudden and dramatic disappearance of cancer. Until now there was no safe way to achieve elevated temperatures without serious consequences. Based on new technology from industry, we now have an apparatus that can safely raise a patient's temperature to 41.5 C. We are testing the efficacy of hyperthermia on patients with incurable cancer so we might use this treatment on earlier disease stage. Laboratory studies indicate that higher temperatures make drugs and radiation more effective.

Another new therapy that offers promise and is being studied at the UW are the interferons. These are natural products shown to control the growth of cancers in the laboratory as well as the clinic. Some of the early clinical testing was done at the UW by Ernest Borden and Michael Hawkins. These doctors have found that interferons control the growth of several cancers such as kidney, breast, melanoma, lymphoma, and plasma cell myeloma. The materials are made in large, purified amounts by new techniques of molecular biology. Like hyperthermia, interferons act synergistically with other drugs against cancer.

Prevention

Much emphasis has been placed on the early discovery and treatment of cancer. I believe the future holds promise to prevent or stave off cancer completely. Today in the laboratory we can give animals cancer-causing chemicals, and after a waiting period we can administer another drug that will prevent cancers from ever developing. In other situations we can use vitamins or antihormones and completely suppress the cancer process. In general these drugs have less toxicity on normal cells. However, we need to test them in patients for several years before they can be used for prevention purposes. We need to discover the appropriate doses, the duration of treatment, and the potential hazards to the men and women who will be taking these pills. The UW is already doing some of the preliminary work, trying to bring these trials to the clinic.

I believe that the future for earlier detection and for prevention will make our current methods obsolete and eliminate the serious consequences of the disease and its treatment. The concepts are already worked out in the laboratory. Careful exploration in the clinic should begin soon. We hope the UW will become a leader in this area.

The Wisconsin Clinical Cancer Center

The WCCC's goal is the improvement in the outcome of cancer treatment through early diagnosis, better treatment, and education. In its research labs and clinics it is training the next generation of specialists and researchers. Over 2,000 new cancer patients come to the clinics each year to seek help and consultation. The nurses, doctors, secretaries, and support staff of University Hospital and Clinics are all part of the program that provides care and treatment.

People are hearing more and more in the media about the progress being made against cancer. What they want to know is, "How do these advances affect me? What can I do to avoid cancer or get prompt diagnosis and treatment if symptoms appear?" In Wisconsin residents may call the toll-free Cancer Information Service (CIS) at 1-800-4-CANCER. CIS is a public service of the Wisconsin Clinical Cancer Center. ☐

The Wisconsin Stillbirth Service Project:

The "Wisconsin Idea" in Practice

By Richard M. Pauli and Catherine A. Reiser
University of Wisconsin-Madison

> **I shall never rest content until . . . the boundaries of our campus are coextensive with the boundaries of our state.**
>
> University of Wisconsin President Van Hise ca. 1905

The Problem. The birth of a new baby is a joyous occasion for most parents. But not all pregnancies have happy outcomes. A stillborn is a baby who has died in utero after having reached at least twenty weeks of gestational life. Stillbirth is common. It accounts for nearly one half of all perinatal deaths. About one in every 125 deliveries results in a baby born still. Nearly 600 infants are stillborn each year in Wisconsin, or put more personally, each day in our state two families will suffer the realization that their baby will be born dead.

Following a stillbirth, parents have two primary questions: Why has this happened? Will it happen again in subsequent pregnancies? The Wisconsin Stillbirth Service Project, which began two years ago, is an effort to establish a community-based system for evaluation of these stillborn infants and subsequent counseling of their families. It is based upon four premises:

1. While stillbirth is common, there is considerable lack of awareness and knowledge of what constitutes an appropriate investigation into the etiology of intrauterine death, which in turn means that stillborns are usually inadequately evaluated;
2. There is ample evidence that when a stillborn infant is extensively studied, congenital malformations or other genetically relevant information is demonstrable in a substantial proportion;
3. Only through such evaluation will etiologic diagnoses be discovered and through this the primary questions—why did this happen? will it happen again?—that parents have be answered;
4. Major impediments to the appropriate evaluation of stillborns include lack of specific evaluative protocols, the unexpected nature of the event, and the distances involved between the hospital of birth and specialized resources.

Fig. 1: Outline of the general protocol used for the evaluations of stillborns.

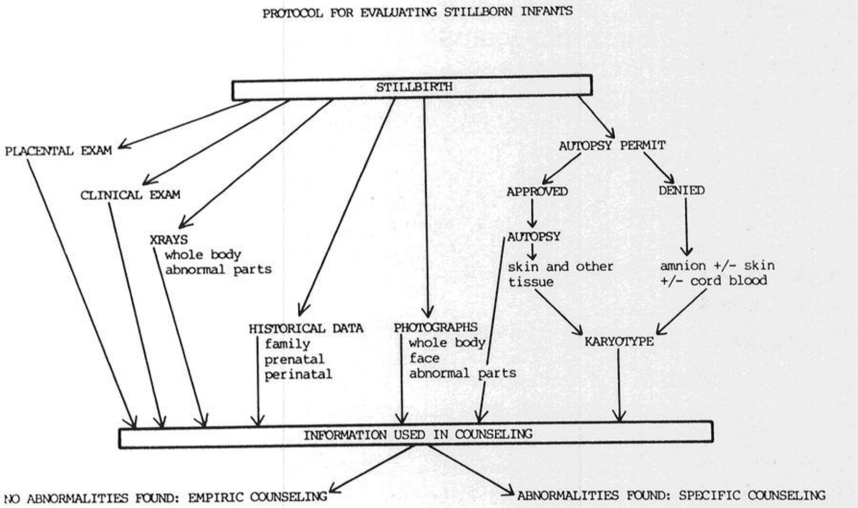
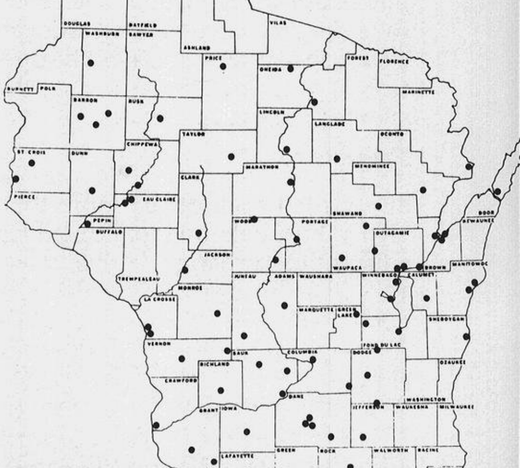


Fig. 2: Distribution of the eighty local hospitals participating in the Wisconsin Stillbirth Service Project



Recognizing that previous programs and efforts to evaluate stillborns have not adequately addressed these problems, we began a *community*-based collaborative effort, in which the primary responsibility for evaluation remains with hospital of birth.

The Process. Initial implementation of a community-based, statewide stillbirth evaluative program required development and dissemination of a general protocol (Figure 1) which includes those processes that previous investigations have indicated are most often relevant in generating causal diagnoses. While considerable data have accumulated demonstrating how often various portions of this protocol yield positive results, previous studies have not critically assessed how often each step is *critically* positive nor under what circumstances certain of the proposed evaluations could be eliminated; therefore we recommend that every part of this outlined protocol be used in evaluating every stillborn infant.

We set up easily followed, algorithmic protocols for each step in the evaluation and incorporated them into protocol packets for use in collaborating hospitals.

Targeted hospitals included all of those in Wisconsin (excluding the Milwaukee metropolitan area) in which 100 births per year or more occur and therefore are likely to experience at least one stillbirth per year. Such targeting reaches hospitals in which approximately 98 percent of all stillbirths would occur. (The Milwaukee area was excluded because in such a densely populated region with a large concentration of major hospitals other models for such evaluations may be more appropriate.) We personally visited each of the more than eighty hospitals and presented an educational program (either a lecture or a videotape which we prepared) concerning parental needs following delivery of a stillborn child and what constitutes an appropriate evaluation.

The majority of local hospitals agreed to participate in this service project (see Fig. 2). In these a local 'contact' person functions as the internal resource person, serves as liaison between our center and the local hospital staff, and is responsible for assuring that protocol materials are available when a stillbirth occurs. Results of the recommended studies are forwarded to the university project director, who reviews all available materials, attempts to establish a specific, diagnosable fetal cause and provides a written summary to the referring practitioner. In some instances (approximately 40 percent of those evaluated) formal genetic counseling is provided through the Wisconsin Clinical Genetics Center and its satellite and outreach clinics.

Results: Compliance. Eighty of the eighty-five targeted hospitals are committed (firmly or tentatively) to involvement in this project (Fig. 2). This high rate reflects the need for the coordination of such services and the apparent value of the protocols. It demonstrates that such a model program can successfully establish collaboration among the university and community health providers throughout the state.

Compliance by participating hospitals may be estimated in two ways. Using expected population frequencies of stillbirth and the date of commitment for each participating hospital, we estimate that 40 percent of stillborns were evaluated through this program. Telephone and mail followup shows an estimated compliance of about 60 percent.

Results: Diagnoses. Through August of 1984, 111 stillborns have been referred. Among the eighty-nine in whom evaluation and review is complete, a fetal cause has been defined for nearly one-half. (This high yield of abnormal stillborns probably indicates a persistent bias of referral—those stillborns with obvious malformations are

TABLE: Diagnoses of Fetal Causes of Stillbirth Through the Wisconsin Stillbirth Service Project

Group	*Number*	*Diagnosis*	*Risk in Next Pregnancy*
High Risk	5		
		Hypochondrogenesis	25%
		Malignant Osteopetrosis	25%
		Mesomelic Dysplasia with Absent Fibulae	25%
		Holoprosencephaly (2)	8%
Intermediate Risk	11		
		Primary CNS Malformation	5%
		Anencephaly (4)	4%
		Gastroschisis	2%
		Congenital Heart Defect	2%
		Trisomy 21 (2)	2%
		Trisomy 18	2%
		Trisomy 13	2%
Low Risk (<1%)	12		
		Turner Syndrome (3)	
		Amnion Disruption (2)	
		Short Cord Disruption (2)	
		Teratogen Exposures (2)	
		Twin-twin Disruption	
		S.E.D. Congenita	
		Idiopathic Nonimmune Fetal Hydrops	
Fetal Causes of Unknown Risk	10		
		Multiple Congenital Anomalies (5)	
		Multiple Congenital Anomalies with Sex Reversal	
		Prune Belly Sequence	
		Acephalus-Amorphous	
		Isolated Cystic Hygroma	
		Potter Syndrome, specific cause unknown	
No Fetal Cause	51		

consistently evaluated while those who, at least superficially, appear normal are less frequently investigated.) Established diagnoses, by risk in subsequent pregnancies, are shown in the table. In five instances the diagnosis carried a high risk of recurrence, while eleven diagnoses imply a moderate risk in subsequent pregnancies. No one diagnosis is predominant nor, in fact, frequent. Several of these diagnoses imply risk not only for another stillborn but for liveborn and affected infants as well. In twelve instances the diagnosis implies no increased risk in subsequent pregnancies. Obviously, determining that future pregnancies will not have increased risk is as important as ascertaining that such risks exist. Occasionally a descriptive but nondefinitive fetal cause was found for which no reasonable estimate of recurrence risk can be given.

Conclusions. Despite considerable logistical and practical difficulties, this program has succeeded in using a unique organizational method to increase the proportion of stillborn babies appropriately evaluated. This experience suggests that there are many advantages of a community-based system. There is a widespread increase in professional awareness of parental and evaluative needs following stillbirth. More stillborns *are* being evaluated, diagnoses generated, and families counseled. Personal contact with eighty-five community hospitals increased the visibility of the University Clinical Genetics Center as a general professional resource. It demonstrates another way in which the boundaries of the campus can be extended to the entire state and may serve as a model for provision of consulting and counseling services to other targeted groups which are dispersed over large geographic regions.

Acknowledgement: The Wisconsin Stillbirth Service Project is supported in part by Maternal and Child Health Block Grant funds administered through the Division of Health, Department of Health and Human Services, State of Wisconsin. ☐

Studies of Aedes Triseriatus

The La Crosse Virus Carrier

By Wayne H. Thompson

University of Wisconsin-Madison

The woodland mosquito *Aedes triseriatus* was a little known recluse occasionally found in forested areas, until it was found to be the carrier of La Crosse virus. When La Crosse virus was first isolated from a fatal case of encephalitis, its source in nature was not known.

During our first studies of viral encephalitis in Wisconsin in 1963, we found brain tissues and records from fatal cases of encephalitis in children and a letter from Bernard Kalfayan, the pathologist at the Gundersen Clinic in La Crosse. He noted that a fatal case of encephalitis in a four-year-old girl from which he sent autopsy specimens was similar to others recently seen in the area. Routine virus diagnostic tests had been negative.

Remaining portions of brain tissue found in the freezer were inoculated into newborn mice and carefully watched. Five days later when several mice died with symptoms of encephalitis, a virus was isolated. Because it was serologically related to, but different from, other previously known viruses, it was named La Crosse virus, after the place it was first found.

La Crosse virus provided us with an improved, more sensitive antigen for use in diagnostic tests. Specific antibodies, and diagnostic rises in titer between acute and convalescent serums, were soon afterward found in twenty-five additional cases of encephalitis in children in southwest Wisconsin. Over 500 additional cases have subsequently been diagnosed in Wisconsin. Several thousand others have also since been found in most other midwestern and eastern states. La Crosse virus became widely known as the most common cause of arthropod-borne viral encephalitis reported in our country during seven of the past ten years.

Areas of endemic activity

Areas of endemic La Crosse virus activity were defined by studying the geographic distribution of cases and antibodies in man and animals. Sentinel rabbits placed in large cages in yards and playgrounds of infected children acquired antibody evidence of virus activity in shady and forested areas.

During serologic surveys conducted in animals around homes of cases, we found highest rates of antibody to La Crosse in forest-dwelling mammals, in about two thirds of chipmunks, and one third of tree squirrels.

Epidemiologic studies associated infections with exposure to rural and suburban areas with hardwood deciduous forests as found in the southwest third of Wisconsin and in adjoining states.

Aedes triseriatus the culprit

The seasonal distribution of cases in children, from late June until fall, provided evidence for a mosquito-borne source. Mosquitos collected around homes of cases of La Crosse encephalitis were processed in virus isolation studies. Five of the first eight isolates of La Crosse obtained were from *Ae. triseriatus*. Addi-

A basal tree hole is the natural oviposition site of *Aedes triseriatus*.

tional isolates obtained by us in Wisconsin and by those in other states were mainly from *Ae. triseriatus.*

The vector status of *Ae. triseriatus* for La Crosse virus was further defined by the natural association of infected mosquitos with infected children and vertebrates in woodlands. We also found that this mosquito could be infected by engorgement on viremic chipmunks, and after five or six days of viral multiplication, could transmit the virus by bite to another vertebrate.

Ae. triseriatus, little known before it was implicated as the vector for La Crosse virus, was seldom caught in routine light-trap collections in nonforested lowland areas where most other mosquitos were first thought to be. It is shade-loving and does not usually travel far from its home. We soon found it to be a persistent daytime biter of children playing in tree houses and others venturing in its forest habitat. *Ae. Triseriatus* infected with La Crosse virus were found to be widely distributed throughout hardwood deciduous forests such as those in the southwest third of Wisconsin and in most other midwestern and eastern states.

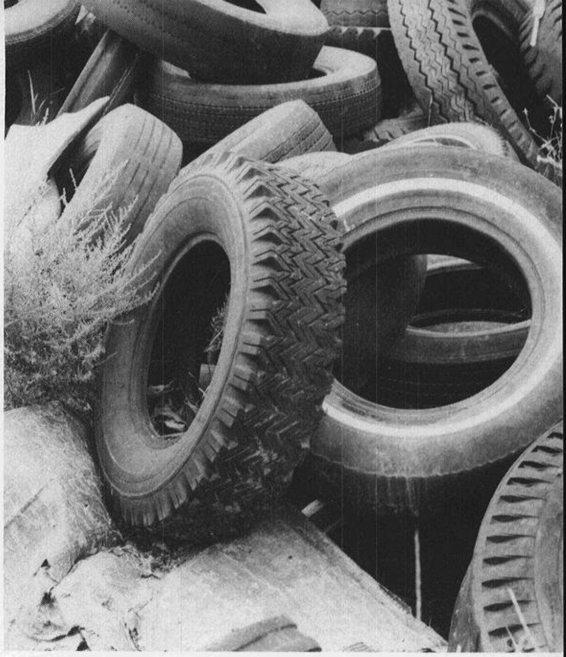
The natural oviposition site of the mosquito was found to be in basal tree holes (rot holes) in the base of hardwood trees, which hold up to a quart or more of rain water and whose small openings retard evaporation. Decaying tree leaves provide nutrient for larvae. During summer *Ae. Triseriatus* deposits eggs in these basal tree holes, old tires, and other water-holding containers. Some soon hatch and emerge; others overwinter as diapaused eggs. Larvae which hatch the following spring develop slowly in relatively cool water in tree holes, with first emergence of adults during mid-June in Wisconsin.

Overwintering mechanism found

Widespread simultaneous appearance of La Crosse virus activity in many forested hillsides during June of each year suggested the possibility that it could be overwintering in these areas, rather than being carried about by birds as most other known arboviruses were. Studies of possible overwintering of virus in chipmunks were negative.

Isolation of La Crosse virus from *Ae. triseriatus* larvae collected during early June provided evidence of the overwintering mechanism. This isolate was obtained from forty-three larvae collected from a basal tree hole in western Wisconsin on June 7, 1972. Since these larvae had emerged from overwintered eggs, they could be the long sought means for the survival of La Crosse virus through the long winter months in Wisconsin. Additional larvae were collected during the following spring before seasonal emergence of adults. La Crosse virus was again isolated, from larvae in two of eight tree holes sampled.

The distribution of La Crosse overwintering by transovarial transmission in *Ae. triseriatus* eggs was studied by following sixty-four tree hole oviposition sites in four hardwood forested areas in suburban La Crosse during 1974. La Crosse antigen was observed by fluorescent antibody technique in dissected mosquitos. Virus was found in larvae collected from each of four areas before seasonal emergence of adults. These tree holes were found to serve not only as foci for overwintering but also for continuing summer-long emergence of virus in these areas.



A pile of old tires found discarded in a dump which was the source of many *Aedes triseriatus*.

In laboratory reared and dissected mosquitos, La Crosse antigen was observed by immunofluorescence in all developmental stages from egg through larvae, pupae, and adults. Transovarially infected females transmit La Crosse virus through eggs to both male and female progeny and by bite to vertebrates soon after they emerge.

We studied venereal transmission of an arbovirus in mosquitos after we found male as well as female progeny of infected females to be transovarially infected. Virus was observed in the accessory sex glands of transovarially infected males and in the bursa copulatrix of most females soon after mating by infected males. High rates of veneral infection and later oral transmission to mice were observed in females mated by infected males after engorgement on the chipmunk, a natural vertebrate host.

La Crosse virus from old tires

During recent years old discarded auto and tractor tires have replaced tree holes as the most common source of *Ae. triseriatus* observed about the homes of cases. Two old automobile tires found behind a garage in suburban La Crosse during May of 1973 contained numerous *Ae. triseriatus* larvae in rain water. Over thirty isolates of La Crosse virus were obtained from these larvae and from both female and male adults reared from them.

Close-up of technician collecting *Aedes triseriatus* from which La Crosse virus was isolated.

How much threat to public health do air-borne viruses cause? Interdisciplinary research teams are seeking answers.

Most of these infected larvae were collected from the old tires after they had been moved a hundred miles to our laboratory in Madison. This showed that La Crosse virus could be carried along in *Ae. triseriatus* larvae and eggs when these old tires are moved about from one place to another, as they often are.

Isolates of La Crosse virus have since been obtained from larvae collected from old tires around the homes of over a dozen cases in and at the edge of the endemic region.

Control of La Crosse encephalitis

Reduced cases of La Crosse encephalitis have been observed in La Crosse County residents along with a countywide control program focused on education and vector reduction. Thousands of old tires and other oviposition sites have been removed and many tree holes closed in the forested hillsides.

Thirteen cases had histories of most likely exposure in La Crosse County during 1978 and 1979. Three cases were found during 1980 and 1981. No cases had histories of exposure in La Crosse County during 1982 and in 1983, although they continued in surrounding counties.

We obtained the first isolate of La Crosse virus from the eastern half of Wisconsin during 1979. This was from *Ae. triseriatus* larvae found in tree holes and old tires in a suburban thirty-acre woodlot ten miles west of Milwaukee. It adjoined the home of a girl who had La Crosse encephalitis. Antibodies to La Crosse were found in chipmunks in this woodlot, but not in those captured in surrounding woodlots.

Results of studies show that *Ae. triseriatus* from the infected woodlot in eastern Wisconsin could be transovarially infected with La Crosse virus, and both male and female progeny were able to transmit it to females collected from several different woodlots in this nonendemic region in eastern Wisconsin.

Twelve of thirty-five old tires found with larvae in the La Crosse focus had been brought into the area by a man moving in from the endemic region in western Wisconsin a few years before. Since all the tree holes and tires found in the area were removed, no cases have been found there.

Other arboviruses in Wisconsin

Our studies have continued to focus on the distribution and control of arthropod-borne encephalitis viruses of public health importance in Wisconsin. Objectives include defining endemic areas and natural maintenance mechanisms for the control of La Crosse and other encephalitis viruses found in Wisconsin.

Four main arthropod-borne (arbo-)viruses have been found to cause encephalitis in man or animals in Wisconsin. The most common is La Crosse virus, which still causes encephalitis each year, mainly in children bitten by *Ae. triseriatus* in the hilly forested southwest third of Wisconsin. The other three, St. Louis, western, and eastern, are bird-borne and produce occasional epidemics here and in other upper-midwestern states. Western and eastern also produce encephalitis in horses.

We find antibody evidence of several other arboviruses also infecting man and animals in Wisconsin. Further studies are underway to determine their distribution and public health importance. One of these, Jamestown Canyon virus, is of special interest. Antibody evidence of infection is widespread in outdoor workers and white-tailed deer in Wisconsin and in many other states. Isolates have been obtained from mosquitos and insects and white-tailed deer, but no isolates so far from man.

We are conducting our comparative micro-neutralization test on acute and convalescent serums of suspected cases to detect those with antibody evidence of infection. Each serum is tested not only for La Crosse but for other California encephalitis viruses infecting man in Wisconsin, including snowshoe hare, Jamestown Canyon, and trivittatus arboviruses. It is important to determine which arbovirus is involved since each one has a different mosquito vector, vertebrate host, and natural maintenance cycle. This information is needed to determine the circumstances of infection of man and animals and for control measures.

It is impossible to name all the many colleagues, technicians, physicians, patients, faculty, graduate students, and others who have made valuable contributions to the studies summarized here. The University of Wisconsin environment has made this kind of interdisciplinary research possible. They have participated in studies about La Crosse encephalitis virus and its control. They have also helped describe a few basic concepts in the La Crosse virus Ae. triseriatus *model, such as overwintering by transovarial transmission, that have since been found important in understanding the natural maintenance and control of other arthropod-borne diseases. There still are many other arboviruses which need discovery and further exploration.* ☐

Medical Physics: What is it?

By John Cameron

University of Wisconsin-Madison

The words physicist and physician both originate from the Greek word for nature. But while everyone knows what a physician does, many people would find it difficult to describe the work of a physicist or the scientific field of physics. Physics involves energy and matter in terms of motion and forces. The entire function of the body can, in principle, be described in terms of the laws of physics. However, because of the great complexity of the body it is necessary to describe its function in more qualitative terms. This description is called physiology. The word is an admission of our ignorance of the fundamental physical processes of living matter.

The application of physics to any biological area is, in principle, included in the field of biophysics. In practice biophysicists are concerned with the physical aspects of macromolecules, viruses, etc. In general their research is not concerned with the human body and how it functions.

The field of medical physics would be expected to cover the many applications of physics to the field of medicine—the physics of the body in health and disease and the physics of the devices used for diagnosis and therapy. Although medical physics should be part of biophysics, it is a separate applied branch of physics with very little overlap between the two fields. There is a much larger overlap between medical physics and biomedical engineering (BME), the application of engineering principles to medicine. Biomedical engineers often design electronic or mechanical instrumentation for clinical applications. A dramatic development in this field is the total artificial heart that was first used on a human recently.

Most medical physicists in the United States are employed in radiology or radiation therapy departments of hospitals and medical schools where they work closely with physicians in the radiological specialities. It is more accurate to refer to medical physicists in the United States as radiological physicists.

There are about 2,000 medical physicists in the United States and about 7,000 worldwide. About half work in radiation therapy (cancer treatment); most of the others work in the other radiological areas. So many work in radiation therapy because an error of only 5 percent in the radiation dose delivered to a cancer can have a significantly bad effect on the patient. Five percent too little can greatly reduce the probability of cure of the disease, or 5 percent too much can increase the probability of serious complications. Physicists are needed to assure that the radiation to the tumor is accurate while minimizing radiation to normal tissues. Medical physicists working in radiation therapy calibrate radiation equipment and supervise the calculations of the radiation dose to the tumor and to the adjacent normal tissues. The actual calculations are usually done by a dosimetrist, often using a computer.

Another large group of medical physicists work in diagnostic radiology—primarily supervising the quality control of the equipment to make sure good quality x-ray images are obtained with a minimum exposure of radiation to the patient. Other medical physicists work in nuclear medicine where they assure the safe use of the radioactivity and supervise the quality control procedures. Some medical physicists work with medical ultrasound where echos from pulses of high frequency sound waves (frequencies of millions of cycles per second) are used to make images of organs in the body. Because of the demonstrated safety of ultrasound compared to x-rays, it is widely used in examinations of the fetus.

Medical physicists usually have responsibility for radiation safety in hospitals and clinics. A physicist who concentrates on radiation safety is called a health physicist. Many health physicists work in nuclear power plants and in laboratories where radiation is used. UW-Madison has six full-time health physicists.

Most medical physicists in the United States perform service work for hospitals and clinics. Research and teaching are usually minor responsibilities. About half of them have an M.S. degree and the other half have Ph.D. degrees.

Medical physicists in medical schools have three major roles: (1) service to the affiliated hospital, (2) education of medical students, resident physicians, technologists, and in some medical schools, graduate students of medical physics, and (3) doing and supervising research. The UW-Madison Department of Medical Physics, with about forty graduate students, is one of the largest basic science departments in the medical school. Most of the graduate students seek an M.S. degree to work as hospital physicists. The others seek a Ph.D. and play an important role in doing research which is the subject of their Ph.D. theses.

About 150 medical physicists have been trained at the UW-Madison—the only medical school in the United States with a department of medical physics. However, many medical schools in the United Kingdom and in Scandinavia have such departments.

The department has a large variety of research underway by the ten tenured faculty. Many of these staff members have joint appointments in the clinical departments of radiology or human oncology. Some research is aimed at the solution of day-to-day problems, but much involves developing new techniques for the diagnosis or treatment of disease. I will now describe briefly some of the current research.

F. H. Attix and P. M. DeLuca are doing research in the measurement of radiation, especially radiation used in treating cancer. Richard B. Mazess has developed sophisticated techniques to measure the bones of the body, which are used in medical centers over the world. It is of great importance in the diagnosis of osteoporosis—the cause of many broken hips in elderly women. Charles Mistretta developed the technique of digital subtraction angiography (DSA)—using a computer to get more information from x-rays of the blood vessels with small amounts of iodine injected into the circulation. DSA is currently in use in hundreds of hospitals in the United States. Its impact on the practice of radiology may be greater than that of computerized tomography (CT) which has gotten much attention in recent years. R. J. Nickles, James E. Holden, and John Gatley work in nuclear medicine physics. A new cyclotron ("atom smasher") will be installed in the medical school during the next year to produce short-lived radioactivity for medical research. Professor Nickles is concerned with the installation and design of the targets to produce the radioactivity; Professor Gatley, a radiochemist, develops techniques to incorporate the radioactive atoms into molecules for research applications; and Professor Holden's research uses computers in imaging the radioactivity in the body.

B. R. Paliwal, head of radiotherapy physics is researching hyperthermia—applying heat to the cancer in combination with radiation. The tumor is heated before or after the radiation therapy treatment. Two major problems are involved: how to heat the tumor uniformly and how to measure the temperature. Microwaves and high intensity ultrasound are both being investigated as heating methods. This research is being done in collaboration with radiation oncologists (physicians who use radiation in the treatment of cancer). William Perman is working on the physics of magnetic resonance imaging (MRI). This technique (previously called nuclear magnetic resonance imaging) uses a very strong magnetic field and radiowaves to probe the chemical structure of the body. An MRI unit manufactured by General Electric Company in Milwaukee ws recently installed at University Hospitals in Madison.

Melvin Siedband has developed a new portable x-ray unit which uses a flywheel to store energy that can then be used in a fraction of a second to take an x-ray. James Zagzebski and Ernest Madsen are researching applications of ultrasound in medicine. Their work has produced better instruments to evaluate clinical ultrasound equipment.

While I have worked in several medical physics areas during my twenty-six years in the field, my current interest is in photobiology. We are developing a technique to measure the amount of "sunburn" power of ultraviolet light. The device, called a UV-B dosimeter, uses a small sample of a special plastic that changes its characteristics when it is exposed to ultraviolet light, responding very much like human skin. This UV-B dosimeter will be useful in ultraviolet research. UV-B causes sunburn, produces Vitamin D in the skin, induces tanning of the skin, and is the major cause of skin cancer. There is now no simple technique to measure the sunburn effect under various conditions.

New research involves the very small magnetic fields produced by the minute currents in the body. These currents are now measured by electrodes on the surface of the body. This investigation looks especially promising for research on the nervous system, since it can be done externally without putting electrical probes into the body and the magnetic fields are not disturbed by the tissues of the body the way the electrical fields are. Faculty from medical physics, neurology, neurophysiology, electrical and computer engineering, and neurosurgery plan to work with this new area of biomagnetism.

Because new physical techniques usually can be used in several medical fields, cooperative research by both basic and clinical faculty members is becoming more common. Medical physicists are often members of such research teams.

The department of medical physics is the home of the Midwest Center for Radiological Physics (MWCRP), one of six such centers in the United States supported by the National Cancer Institute (NCI) to review the physical aspects of nationwide research involving the treatment or detection of cancer. The MWCRP reviews radiation facilities in eleven midwestern states.

The department is also the home of the UW Radiation Calibration Service (RCS), which provides radiation services using the unique facilities at the University of Wisconsin. These include measurement of radiation exposure to patients having x-rays for mammography or other x-ray studies using thermoluminescent dosimetry (TLD)—a University of Wisconsin development. The RCS also includes an accredited dosimetry calibration laboratory (ADCL) which accurately calibrates radiation measuring instrumentation. There are only four ADCLs in the United States.

The future of medical physics is almost certain to show considerable growth as new physical technology finds unique applicatons in the diagnosis and treatment of disease. ☐

BOOK MARKS/WISCONSIN

THE WARRIOR AND THE PRIEST: THEODORE ROOSEVELT AND WOODROW WILSON

by John Milton Cooper, Jr.
Cambridge, MA: The Belknap Press of Harvard University Press, 1983. 442 pp. $20.00.

By James J. Lorence

Most students of American history acknowledge the formative influence of progressive era reform on the political, economic, and social structure of the modern United States. It is equally clear that Theodore Roosevelt and Woodrow Wilson provided the executive leadership which mobilized the forces of innovation, serving as catalysts for the process of social change. By carefully examining their lives from a comparative perspective, University of Wisconsin historian John Milton Cooper, Jr. advances our knowledge of the progressive presidents and their roles in the development of the twentieth century regulatory state. Cooper places his subjects at the heart of the political culture of their day, arguing persuasively that the two were no less than the "principal architects of modern American politics." Although some may question the breadth of this assertion, all will agree that *The Warrior and the Priest* is biography at its finest.

Recognizing the centrality of Roosevelt and Wilson to the politics of progressive America, the author uses comparative analysis to explore both their interrelatedness and their distinctiveness as party leaders. Cooper makes much of his subjects' roles as intellectuals, and he finds further meaning in their common pursuit of power. It is this characteristic that leads him to cast the two in terms of Nietzsche's "philosophical embodiments of the Will-to-Power, the Warrior and the Priest." This distinction in fact becomes the organizing principle for an excursion into intellectual as well as political history.

The book is neatly divided into four segments dealing with the life experiences of each man: prepresidential careers, presidential responsibilities, political campaigning in 1912, and wartime leadership. Through frequent references to the activities and views of the respective adversary in each section, Cooper successfully minimizes the potential loss of continuity which is an inherent danger in comparative biography as a medium. Nowhere is the interrelationship clearer than in the experience of the two party leaders during World War I, a period during which neither was able to convince the American public of the wisdom of full involvement in world politics on a lasting basis. While Roosevelt espoused the warrior's idealism, Wilson emerged as a realist who grasped the reins of power firmly and provided practical leadership in disinterested pursuit of a goal. Cooper's unconventional employment of these terms will no doubt stimulate discussion among historians of progressive foreign policy.

In domestic politics, each labored to remake the image of his respective political party. Roosevelt, impatient with a conservative Republican Party linked to capital, failed to move his followers towards a less materialistic stance; Wilson, on the other hand, proved largely successful in reshaping the Democratic Party into a modern coalition of the less advantaged, committed to the welfare state. In this connection Cooper asserts that the ideas of both found expression in the programs of Franklin D. Roosevelt and the New Deal.

At no point were the political philosophies of Roosevelt and Wilson more clearly delineated than in the pivotal campaign of 1912, during which an intelligent debate centered on the nature and ends of American politics. In this encounter, Cooper portrays Roosevelt as the idealist, exhorting his followers to rise above self-interest in support of the public interest; the essence of his leadership was, in short, to be found in individual sacrifice for the common good. Wilson, however, emerges as an idealist of a pragmatic bent, one who accepted self-interest and legitimized its pursuit "to promote the public good." Wilson's idealism was also reflected in his emphasis on reason in politics, a rational approach to political problems.

Perhaps the most significant issue of the campaign was the trust question, a problem which had by 1912 become the fundamental concern of the age. Americans of the progressive era struggled to cope purposefully with the social and economic consequences of unrestrained industrial capitalism. For both men, the giant corporation posed an imminent threat to the public interest they sought to preserve; they parted company over the most appropriate governmental response to corporate power. Cooper sees Roosevelt's view as "static," in that it was based on an acceptance of the corporation as a natural result of efficient management; his corollary assumption held that regulation of competition together with social welfare reforms would suffice to safeguard the public interest. Wilson, on the other hand, argued forcefully for the necessity of economic renewal from below as prerequisite to the maintenance of opportunity and the existence of the good society. Regarding the trust as the product less of natural evolution than duplicity and manipulation, the Democratic leader espoused a "dynamic" view of economic and social process which emphasized constant regeneration from the ranks of incipient entrepreneurs. Cooper argues that this vision of the economic future marked Wilson not as a proponent of nineteenth century *laissez-faire*, but rather as the spokesman for a modern concept of political economy grounded on the idea of expanded government.

Although the author articulates this distinction clearly, effectively, and with considerable grace, it is difficult to avoid the conclusion that these two seekers after power held much in common; indeed, Cooper acknowledges many similarities in their political viewpoints and approaches to economic and political change. In the final analysis, the rivals shared a commitment to activist government which united rather than separated them, despite their vigorous and ongoing political debate; this commonality emerges as a theme at least as significant as the important distinctions noted.

It is a shared belief in interventionist government which Cooper views as their link with the urban liberalism of Franklin D. Roosevelt, whose programs owed much to both men. Presidential leadership during the New Deal drew inspiration from the progressive models: "the Theodore Rooseveltian role of transcendant national leader" and the Wilsonian precedent of party leadership both found expression in Franklin D. Roosevelt's administration. There was one last irony in the Wilsonian influence on foreign affairs: the future use of his experience as an example of excessive idealism to be avoided. Conversely, Theodore Roosevelt's political legacy was expressed in FDR's wartime leadership and "the establishment of a lasting foreign policy consensus."

Cooper's carefully reasoned arguments with regard to the Roosevelt-Wilson impact on the presidency, modern politics, and foreign affairs are most provocative. *The Warrior and the Priest* makes an important contribution to the debate over the relationship between the progressive standard-bearers; it also establishes comparative biography as a useful tool in the hands of a skilled historian. Its pages are packed with insights for the student of modern American political culture, and readers are certain to gain from it a more sophisticated understanding of two presidents whose leadership had a profound impact on the future of the office they held.

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THE LOST TRAVELLER'S DREAM

by Kelly Cherry. New York: Harcourt, Brace, Jovanovich, 1984. 231 pp. $13.95.

By Kathy White

The Lost Traveller's Dream is about writing as self-discovery. It is also a collection of musings on the nature of being, God, the universe, and the relation of art to all of them.

Narrated by three characters, the novel is divided into three sections: Kate: In the Land of Our Enemies; Lindy: From the Land of Loss; Nan: The Lost Traveller. As a writer who created Kate (also a writer), who created Lindy, Nan at first asserts that she is the only "real" character, but eventually she discovers that even she is not real, never has been, and that Kate and Lindy are different facets of her own ill-formed identity. Her quest for the "ground of [her] own being" leads to the knowledge that she is "many beings, many translations, texts full of signs showing that "the way leads under a hill. Here then is the traveller's dream, here now, of the Word made flesh." Only through the fusion of Kate-Lindy-Nan can she achieve being.

Presented as the contents of her notebook, Nan's section is by far the most interesting. It reveals Nan as the controlling intelligence of the novel and contains her notes on a possible book, background information on characters, notes on characters, and possible lines. In the creation of her character Kate and of Kate's character Lindy, Nan tells us, she is reexamining her own world "by *transferring* its people and events first to my notebooks and then *translating* them into text." This concept is important, for in the process of creating fictional characters Nan translates *herself* into text: she becomes flesh made word.

Nan's section also gives the first clue to what has gone on in the first two sections. Then, once Nan tells us what she's doing, she introduces a number of new characters who reside in the same neighborhood as Kate-Lindy-Nan, spins tales about some of them, and finally ends the novel with no ending at all.

Chapters one through five are written almost as if each were a separate short story. In fact, chapter four is a short story written by Kate. As a result, there is a confusing and even frustrating lack of continuity between the chapters, especially in the section on Lindy. At the end of chapter four, Lindy returns from Rotterdam to live with her father in Richmond. But at the end of chapter five, Lindy is in New York thinking of returning to the south to live with her father. There are no conventional time markers to indicate when that chapter occurs in relation to the previous chapter.

Furthermore, there is such sparseness of detail that characters are only superficially developed. For example, Kate falls desperately in love with Matthew, but there is simply no insight into how or why this relationship attains such importance that Kate contemplates suicide over it. Lust accounts for much but not for Nan's attachment to this man. Most disconcerting are the chapters on Lindy. In fact, were it not for the section heading telling us the narrator is Lindy, it would be difficult to tell that the chapters are about the same person. Moreover, the second chapter of Lindy's section introduces two characters as if they were already familiar to the reader: Dennis and "She," who turns out to be Faith, the allegorical faith lost by Lindy. And so little is known about Lindy herself that the reader does not really care what happens to her. Nan tells us that she could have gone on with her, "but to what purpose? Her image of herself could only keep batting itself back and forth." If the creator of the character does not care to continue with her, why should the reader?

The form of this novel is meant to reflect its content. Nan points out that life is composed of limitless numbers of isolated events, that each of us is an event, each dependent on others for our reality. She observes: "The truth is that to achieve reality in any given ontological plane, one must inter-be with others who share that plane." Thus the character she created, Kate, has her own life, as does Lindy, the character Kate created, and so on. The fictional Kate, like her creator Nan, keeps a journal in order to discover through the act of writing some way to interpret herself.

Unfortunately, their reason for writing to attain self-discovery is so that men will take them seriously. Kate is hopelessly dependent on men and defines her worth in terms of her ability—or lack of it—to attract and keep men. Nan complains that no man has seen her as real. She hopes at last that a man will love her because a man will read her words and "reconstruct, from all my literary deconstructions, me." Nan worries over her identity in the same way Kate worries about aging. Self-knowledge is an admirable goal, but I believe it ought to be sought as an end in itself, not as a means of making oneself more attractive to men.

Another concept of the novel reflected in its form is that all art is a return. Nan uses the idea of the interdependency of human lives and the concomitant idea of the impossibility of ending anything once it is begun as a defense against those who would attack her writing. Once Kate, Lindy, and Nan fuse, "they" begin to receive letters from someone complaining of their writing. Finally they meet their critic, who wants greater significance, more meaning, and more analysis of characters—the very things I had been looking for as I read the novel. At the same time this final section is unfolding, they are narrating the story of a man, his wife, his mistress, his secretary, and his son, most of whom converge on a square just as a sniper begins shooting at them. And then they refuse to provide an ending to the story. The justifiably outraged critic accuses them of a cheap trick. Their response? "We don't care. . . . Who knows what ending a beginning might lead to? We were ourselves only part of a larger story, whose ending we could not know."

That hypothetical critic is right: the ending—the novel, finally—is a cheap trick. It is true that all art is at the same time an extension of the artist and an exploration of the artist into herself, but one can carry that concept just so far before becoming hopelessly entangled. As Nan points out, "I could have gone on postulating dependencies all the way back to the First Cause; I could have indicated an infinite regression with a well-placed ellipsis." As she observes in a brilliant line, "We are born into becoming, but bruised into being." But the novel as a form is, after all, a self-contained fictional unit. And while the genre allows for a great deal of experimentation, including calling attention to the author as creator and insisting that no story ever ends, certain things are obligatory if the author hopes to keep the reader engaged in her creation. Significance and depth of character along with a satisfactory denouement of action are vital characteristics of fiction. Kate-Lind-Nan's flip remark "We don't care" might very well be the attitude of readers of this novel.

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GENERATIONS
by Harold and Stephen Grutzmacher. Peoria, IL: Spoon River Poetry Press, 1983. 62 pp. $3.95.
MUSIC FOR MONET
by Robert Schuler. Peoria, IL: Spoon River Poetry Press, 1984. 72 pp. $4.50.
TUNNEL VISIONS
by Felix Pollak. Peoria, IL: Spoon River Poetry Press, 1984. 37 pp. $3.95.

By Ronald Wallace

What makes a good poem good? Howard Moss, poetry editor of *The New Yorker*, defines a good poem as "one I like," which may be what it finally comes down to for any reader. But why does a reader like one poem or poet, and not another? Poets themselves have tried to be more specific. Wallace Stevens, for example, insisted on what he called "the essential gaudiness of poetry." For Stevens, a flamboyant surface—the music and flash and dazzle of language—was essential. Poets like Hopkins or Dylan Thomas or Amy Clampitt immediately come to mind, the linguistic urgencies of their surfaces entrancing the reader.

John Berryman defined another kind of urgency when he insisted that the "best thing for a poet is to be almost crucified." For Berryman, intensity of subject matter was essential; excesses of pain or joy could lift the poem to greatness. One thinks, perhaps, of Whitman or W. D. Snodgrass or Sharon Olds, the urgency of their subject matter compelling the reader's attention. In any case, without some sort of urgency the poem goes flat, sits lumpish on the page.

Of the four poets under consideration here, Robert Schuler relies most on the urgency of his music, and Felix Pollak relies most on the urgency of his subject matter. Harold and Stephen Grutzmacher, the father and son coauthors of *Generations*, unfortunately rely too little on either.

Generations is not without interest. The notion of a father-son book is an intriguing one, and the poems in which the two acknowledge each other are interesting. In "My Son Writes Poems" Harold captures some of the wonder of reading poems "not my own but of my own," and seeing "words not mine but somehow / Born from mine." Indeed, Harold's strength lies in his meditative intelligence, his wit, the quirky play of his mind. When he relaxes into his true voice, he is capable of lines such as these from "Mice": "In a calm one would think Keats could / Whisper through the gap between moon and clouds, / But he is very busy being dead." Too often, however, the poems slip into doggerel ("rain, rain, go away, / little poets want to play"), or lurch into bombast ("the inkdream's rape / of virgin paper traversing / Sex and Christ"). The language is too often abstract or flat, the syntax too often confusing. Passive voice constructions, inverted syntax, and sentence fragments abound. In a poem like "When Daughters Leave," for example, the potentially rich emotional center is disrupted by the fractured syntax:

> When daughters leave
> Ripples smarl the paney pond
> And no birds sing to sweeten
> Whatever psychic stillness
> Masking selves.

Is "masking" a gerund or a participle? Is "selves" a verb or a noun? Some of the grammatical confusions in the book may be a conscious mimicking of the great modernist experiments with language. But they ring false here, adding awkwardness and strain.

Stephen's half of the book is written in a more conversational idiom. At his best, as in "Ellen—the Bench Lady," Stephen conveys a jazzy energy, adopting a streetwise persona. In "To a Case-Patient in a Psychology Textbook" he teases the reader with a series of merrily mixed metaphors:

> Harry, you say words collide
> Inside your head in a jumbled
> Traffic-jam of syntax.
> . . .
> Well, Harry, I say not to worry—
> All you need is a net.

But such playful language is rare here, the poet too often settling for cliché: "childhood's joys," "the forest's lush growth," "flowers burst / in twinkly splendor," "lofty citadels," "unimagined heights." The worst example of such writing is the poem, "This," a Christmas card for the family that should have remained on the mantelpiece. *Generations* could have been a better book. Both poets reveal a capacity to engage and move. But there is finally little music or magic here.

Robert Schuler's *Music For Monet*, on the other hand, is all music and magic. Gerard Manley Hopkins' advice that you should read poetry with your ears seems particularly appropriate here. In the opening poem, "Space-Time," for example: "slow rain drums down drains / first earth-breakers daffodils swamp buttercups / bloodroot & false rue anemone steam out of Wisconsin / sand while Miles' horn rings in & out of mist / round Green Dolphin Street." The language sings and bites, playing its jazzy riffs of movement and color. In "The Lake" Schuler insists that "the soul must be / washed with music," and the first section of the book is indeed awash with music—music in the language, music as the subject or occasion for most of the poems. Schuler is a synaesthesiac, hearing colors, seeing sounds, tasting and smelling melodies.

Throughout the book the lush combination of textures, odors, and colors predominates. In the second section, for example, "smoke," "salt," "cologne," "garlic," "honey," "roses," and "blood" evoke a series of portraits of women, from the perspective of an amusing boyhood initiation to that of a serious sexual maturity. In the third section the hothouse flowers give way to snowscapes, both external and internal. And in the final section, a series of evocative western poems enlarges the poet's customary region.

There is a danger in this kind of poetry that the manner will substitute for any matter. The impressionistic lists of sensory details can become monotonous, recalling too insistently the fruitcakes of image and sound baked by Gerard Manley Hopkins: "all flecked flaked flayed gold," "blue-black gray sallow yellow silver / foam," "sink into the apricot- / pink wrinkles the wimple the rumple the ruck / of flesh." Relentless description and short-hand fragments can blur to the point that all the poems begin to sound alike. But the flash and dazzle is attractive, successfully displaying the personal aesthetic Schuler outlines in the last poem in the book: "I want to write / a poem strung as tight as this March / wind round our bones / a lyre whose scarred strings ring / now down the sands of Rimilly Hissa / where all lovers end / those long circling walks towards the sea / the fat lemon moon bursting / seeds of their eyes"

If the primary urgency of Robert Schuler's poetry is the essential gaudiness of its style, the primary urgency of Felix Pollak's *Tunnel Visions* is the intensity of its subject matter. Pollak's experience of slowly going blind is probably the kind of experience to which Berryman was referring when he claimed that the best thing for a poet was to be almost crucified. *Tunnel Visions* is a tightly unified and moving collection of poems, short prose pieces, and translations, all focusing on blindness.

The risk of writing such intensely personal poems is that of self-pity or self-indulgence, as is evidenced by some of Berryman's later poems—notably those in *Love and Fame*. The marvel of Pollak's poems, therefore is their delicacy of touch, their restraint and wit, their ability to ennoble the reader simultaneously with fierce pain and joy. The poems are powerful and poignant—personal without being private, moving without being maudlin.

If Robert Schuler's poetry is characterized by a rich kaleidoscope of color, Pollak's is predominantly black and white. The images that prevail here are images of shadow, texture, milky blurs, vibrations, snowfalls, moths, thickets, drownings, spiders, rain, gauze, black holes, nightmares. The setting of many of the poems is one somewhere between twilight and nightfall. The world is closing down, shutting the poet out. In the title poem, for example, "Slowly, / the world contracts, wrapped / in a musty smell." And "Reality" is a paradigmatic example of the lyric grace, the quiet humility, and the horror of inescapable nightmare, that characterizes these poems:

It is like speech going
into silence—into
muteness. It is a deafening
of eyes, it is like a candle's
burning past its wick, it is
like impotence, as one lies
beside the beloved.

Intolerables
are a succession of stairs:
one intolerable
always leading to another.

I dreamed I picked up
a blind man's white cane
by mistake, then could not
find the place to return it.

And yet, for all his honest confrontation of pain and nightmare, Pollak refuses to despair. An element of celebration runs through the book, a playfulness, an abiding affirmation of human love. In "Galileo" the blind astronomer envisions "gliding on a moonbeam into space . . . my ears / hearing the music of the spheres pierced / by my shout of triumph." In "Of Nightmares and White Canes" Pollak can laugh at himself: "The other day at a party, / I spoke to the wooden statue of a madonna, / indignant about her not talking back." Talking books give him "the willies." And when he asks a fortune teller "what of the future?" she replies, "That remains / to be unseen." Finally, in the wonderful prose piece, "The Seeing-Eye Dog," Pollak recounts the story of a blind seeing-eye dog and a sighted master who allows the dog to guide her, partly out of love for the dog, and partly in memory of her dead blind husband to whom the dog (then able to see) had been faithful. The humorous compassion of the story, and Pollak's loving manner in the telling, reflects the tone and spirit of the whole book.

Felix Pollak may be losing his vision, but he is not losing his visions. He may be losing his sight, but he is not losing his insight. *Tunnel Visions* is a powerful, moving, and affirmative book, a handsome addition (along with Robert Schuler's *Music For Monet*) to Spoon River Poetry Press's increasingly impressive list.

Ronald Wallace's most recent books are Tunes For Bears To Dance To *and* God Be With the Clown: Humor In American Poetry. *He is director of creative writing at UW-Madison.*

GOD BE WITH THE CLOWN: HUMOR IN AMERICAN POETRY

by Ronald Wallace. Columbia:
University of Missouri Press,
1984. 235 pp. $23.00.

By John Rosenwald

First let's get one thing straight: humor is serious business. In this study Mr. Wallace, who is professor of English and director of creative writing at UW-Madison, is not talking about limericks or light verse or any poetry that's merely funny. From his introductory chapter, where he comments on the lack of critical discussion of the humor in American poetry and attempts to establish the theories, methods, and themes central to such a discussion, through the five central chapters on individual poets (Whitman, Dickinson, Frost, Stevens, and Berryman), to the whirlwind concluding glance at the contemporary scene, Mr. Wallace is headed straight for that strand of American poetry which uses humor to provide cosmic affirmation for a world tormented by religious doubt and threatened by personal and cultural annihilation.

The healing function of poetic humor is evident throughout: "Berryman uses his comedy as a means of facing fear, dread, and anguish without seeming lugubrious or self-pitying, a means of facing ruin and going to pieces while affirming the self and its absurd aspirations" (201); Frost needs comedy to reconcile "separation and union, disharmony and healing" (120); Dickinson's "comic sense continually militated against despair and madness" (104); Whitman's " 'Song of Myself' is . . . a great comic poem" (75) which "reflects the death and rebirth of a god that is at the heart of primitive religious ritual and myth" (74). For these poets, as Mr. Wallace reads them, humor is no laughing matter.

All this is as it should be. One of the great contributions of Northrop Frye and his followers has been a heightened sense of the complexity and significance of humor in our culture and literature. But treating humor seriously has some sandtraps. I miss in this study the simple romp of some of cummings's or Williams's work, the bizarre hilarity of Corso's "Marriage." Given Mr. Wallace's serious tone, it is fortunate that he identifies and keeps a whimsical eye on the "tweedy professor" in the corner and avoids pomposity throughout.

A more significant sandtrap is that of definition. Just what *is* humor? From his safe position on the spectator's stand, the reviewer can look skeptically at all attempts to define the ineffable and say with Imamu Baraka, "I certainly wouldn't like to go out on that kind of limb." Mr. Wallace, however, must, and here he is only partially successful. Wisely recognizing the weakness of much comic theory, he restricts his initial discussion of humor to a one-page recapitulation of Bergson, Meredith, Freud, and Frye (11-12); only in reference to specific texts does he add other, often more recent and more provocative, theorists: Emerson, Auden, Van Ghent, Underwood, more Frye. As a result, Mr. Wallace's concept of humor emerges slowly and fragmentarily and perhaps with some confusion. He tells us, for example, the modes most often used by American poets are "satire, irony, and parody" (32), but humor itself incorporates "wit, satire, irony, parody, farce, burlesque, and play," and is "less a form of comedy than an attitude towards life. . . ." (49). Much later he comments somewhat ambiguously that "satire has not been a central mode for contemporary poets, whose comedy usually tends more to humor" (211). In the context of the whole book, the point may be well taken—that "humor" is a deeper, richer, form of expression than "comedy," more affirmative than "satire," but such a context could be provided more concisely and more effectively.

Part of the problem is scope. Given the gap in the critical literature that Mr. Wallace is trying to fill—all forms of humor in the history of American poetry—he should not be faulted too much for not doing everything in these two hundred pages. Where he succeeds is where it counts most: in his remarks on humor in American culture and his investigations of individual poems. The book is filled with commentary on popular American humor (Crosby and Hope to Woody Allen, with dozens in between) that is secondary to the main argument but contributes greatly to the sense of humor Mr. Wallace establishes. And his skill at close analysis permeates the text. He finds new things to say about chestnuts as old as Frost's "Mending Wall"; he compares wonderfully two poetic encounters with the sea's sexuality by Dickinson and Whitman; he plots with considerable acumen Stevens's "The Comedian as the Letter C."

Perhaps where Mr. Wallace becomes most effective is in the chapter on Berryman. Throughout the first five chapters the author has focused on two figures from Greek comedy, the *alazon* and *eiron*, translated in this country into the "Kentuckian, the ring-tailed roarer" and the understated "Yankee." He demonstrates how American poetic humor depends on these figures. The treatment may be a bit mechanical—Whitman's *alazon* contrasting with Dickinson's *eiron*, Frost combining the two—but it is interesting and for the most part convincing. In the Berryman chapter, however, Mr. Wallace goes much further. He shows the direct connection between Berryman and the Greek tradition, describes how the American minstrel show utilized that tradition, and discusses in detail how Berryman used both the classical and American forms as structural and thematic devices in the *Dream Songs*. He clarifies individual poems and aids our understanding of the sequence as a whole.

Overall, Mr. Wallace has made three major contributions. The first is his specific treatment of specific poems by five major American poets. The second is his tracing of the use of the *alazon* and *eiron* characters by these poets and others in an attempt to clarify the nature of American humor and humorous poetry. The third is his insistence on the importance to our literary heritage of humor as a means of dealing with tragedy. In the first two areas there is no doubt that Mr. Wallace's success is substantial. Permit me, however, two brief comments on the third. One might argue that there is a strain of American humor, barely mentioned here, which is *not* affirmative, which ends in disintegration rather than harmony. One example might be Russell Edson, who brilliantly controls his verbal nonsense along comic lines, but leaves the impression that in the background there are other forces over which he, and we, have no power.

Second, I am pleased to take vigorous exception to Mr. Wallace's final comments. He fears that poetry, "which was looked on as a kind of substitute for religion by some modernist poets, has lost much of the prestige and aura that once surrounded it" and posits "although there are probably more poems being written today than ever before, there are probably also fewer people reading them" (219). Fortunately, he's wrong: sales of poetry are thriving, not just of Rod McKuen but of Galway Kinnell and Carolyn Forché. And thousands attend poetry readings every year, including those at the University of Wisconsin organized in part by Mr. Wallace himself. In Madison, in Beloit, in Milwaukee, around the state and throughout the nation—poetry, humorous and otherwise, is alive and well. As poet, organizer, and critic, Ronald Wallace is contributing to that health.

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SLAVERY AND RACE IN AMERICAN POPULAR CULTURE

by William L. Van Deburg.
Madison: The University of Wisconsin Press, 1984. 288 pp.
$29.50 cloth, $12.50 paper.

By Bruce L. Mouser

Readers who have not read a serious work about black Americans, slavery, or race in several years and who would like to read something general but well researched will find this work by William L. Van Deburg of the Afro-American studies department at UW-Madison an excellent choice. In the introduction the author clearly delineates his scope which includes the works of novelists, historians, dramatists, poets, filmmakers, songwriters—to name the principals—who have produced materials "by and for adult Americans," and how these artists and literati have perceived and interpreted the Afro-American slave and race experience. Van Deburg excluded newspapers, editorials, comic books, religious literature, radio, and sports from his definition of "popular culture." He also disclaims that this work should represent the last word on the subject, a disclaimer that is indeed well made.

The author carries us chronologically from 1619 to 1980, noting how selected commentators have treated the subject of slavery and race "at the time." He chooses substantive provocative subheadings such as "The Noble Captive," "Whites in Blackface," "Slavery in the American Canaan," "Novel Reforms," "The Minstrel's Song," "Life on the New Plantation," "The Black Storyteller," "Technicolor Dixie," "Black History Revised," "High Expectations and Low Art," and "The Hollywood Whitewash." As a general reader of black Americana, I enjoyed the book and applaude Van Deburg for attempting to draw together the contributions of so many artists and for succeeding in packaging the material in such a readable form.

The value of the work depends greatly upon the audience envisioned. Specialists, for instance, will doubtless find the work a special resource for footnote citations, nearly seventy pages worth. The University of Wisconsin Press, incidentally, should be congratulated for being willing to print such complete listings. The specialist will also find it a veritable mine of quotable materials, intriguing tidbits, the stuff of lectures, some of which we are aware but now conveniently assembled in usable lecture-ready form. Of particular interest will be chapter IV, "From Slave to Citizen, 1861-1965," which accounts for more than a third of the book and which might be assigned for classroom use. In general, however, I suspect that the specialist will use this book for lecture construction and not for classroom readings.

There are weaknesses in the book which ought to be noted. The specialist, doubtless, will find the bibliography neither select nor complete enough to be a useful tool. It makes no clear distinctions between the "best" sources, according to the author, and the "next best." Those readers who enjoy footnote reading will be most unhappy to find that their favorite source may not be listed in the bibliography at all. A second weakness is the uneven quality of the chapters. It is clear that chapter IV, noted above, is the core of the book. Chapters I-III have limited focuses, ignoring much of the work by abolitionists and evangelicals in England which had a direct bearing upon attitudes developing on this side of the Atlantic. These early chapters also neglected to deal with free blacks in a serious way, ignoring the activities of urban blacks in border and northern states before the Civil War.

Philosophically, Van Deburg might be classed as a moderate on the question of race. Radicals might find him entirely too conservative, while conservatives will probably interpret his remarks as racist, in reverse. Rather than join that argument, it is better to permit Van Deburg to speak for himself about the quality of writing to come out of the South after the Civil War: "Collectively, postwar southern authors developed a singularly compelling literary device which shaped the popular imagination. They disseminated and popularized a caricature of the elderly ex-bondsman who, blessed with a jolly disposition, a commodious lap, and a keenly developed ability to spin tales, veritably mesmerized young white children with stories from antebellum black folklife." (96) Similarly: "The spread of proslavery attitudes into postwar popular culture reassured whites across the nation that though they may have disagreed intensely about the slave labor system, they were in complete agreement about Anglo-Saxon superiority. The ultimate success of their hidden agenda depended upon sustaining the belief that blacks would accept, indeed wanted, second-class status and continued white supervision. So, on the postbellum American stage, when white characters asked black characters for help, the ex-slaves eagerly answered 'Yes . . . ., we's all ready to go whar ebber yo'-alls want us ter go.' This was the white hope at the end of the century. This was the heritage of the national experience with slavery and racism." (117) Indeed, there are conspirators and villains galore in this book.

While the specialist will have special arguments with Van Deburg about particular interpretations or presentations, the generalist, I think, will find two principal disappointments in the book. First, the author's treatment of Alex Haley's controversial book *Roots* is entirely too superficial, especially considering the scholarly debate and lawsuit settlement reached by the publishers. One has the impression that, once again, there were villains out to get a successful black writer. The second is an apparent underlying premise that ". . . black and white interpretations of the slave experience have, to a remarkable degree, remained distinctly different. As Afro-Americans become more influential in white society so, too, will their perspectives on history." (159)

Against these criticisms, however, is the recommendation to read the book. Van Deburg has an easy writing style that makes for relaxed and informative reading. You won't waste your time on this one.

Bruce L. Mouser, professor of history at UW-La Crosse, is presently engaged in research concerning black settlers and entrepreneurs in Mississippi River towns during the nineteenth century.

U.S. 40 TODAY

by Thomas R. Vale and
Geraldine R. Vale. Madison: The
University of Wisconsin Press,
1983. 198 pp. $27.50 cloth;
$14.95 paper.

By Charles W. Collins

U.S. 40, in the 1950s, was an important, state-of-the-art highway, spanning the continent from Atlantic City to San Francisco. George R. Stewart was one of the travelers who journeyed across America on U.S. 40, exploring its environs and chronicling its history and geography. In his classic book, *U.S. 40*, published in 1953, Stewart documented his journey in essays and photographs. This work represented Stewart's view of both the highway and the region through which it passed. It was a slice of America from a temporal and spatial point of view.

In the late 1970s and 1980, Thomas R. Vale and Geraldine R. Vale crossed the United States retracing Stewart's route, tracking down the sites Stewart had photographed and assessing the landscape change that had taken place in the intervening thirty years. The authors did not attempt to replicate Stewart's work in every detail. Whereas Stewart presented ninety-two scenes, the Vales have included only seventy-two, leaving out duplication as well as scenes which represented people rather than landscapes. The pairs of photos are consistently juxtaposed, with the

Stewart photos above the Vale photos. An essay of a page or less accompanies each photo pair.

The route is divided into seven sections beginning with Atlantic City to Baltimore: The Atlantic Coast, and ending with Reno to San Francisco: The Pacific Coast. Other sections include Appalachian Highlands, Middlewest, East Becoming West, Rocky Mountains, and the Dry Section. The first and last sections have only five and eight pairs of photos respectively. All other sections contain at least ten pairs. Each section begins with appropriate maps as well as an enhanced satellite view scaled to one of the maps. An introduction of a page or two precedes each of the sections. In addition, the book contains a preface, an introductory chapter, a summary chapter, end notes, and four-page index.

The retracing of Stewart's route was no mean task. The Vales dealt with the normal difficulties of travel as well as the problem of identifying the exact location from which Stewart's photos were taken over thirty years before. In spite of increased traffic and an occasional hill or roadcut that had fallen victim to the designs of highway engineers, the Vales succeeded surprisingly well. Their photos, if not in all cases located identically to Stewart's, are certainly close enough to enable the reader to make the necessary comparisons.

If the photos provided the grist, the Vales' analysis has been the mill. The resultant essays, although limited to a page or less, provide the reader with sharp, interpretative prose. The Vales have demonstrated that they have the tools of the scholar, the geographer, and the writer. They have not hesitated to go beyond Stewart for their material. Their appreciation for geography and the nuances of landscape evolution is apparent in the easy personal style in which *U.S. 40 Today* is written. It is a book that looks at two temporal and spatial cross sections of the American landscape. It shows us where we were, where we are, and asks us to consider where we are headed.

Like any work of this nature, there are points where the reader would like more information, or where trivia intervenes. For example, our understanding of landscape evolution is not advanced by knowing that while a streetlight standard is unchanged "the glass globe is slightly more rounded today," or that a fire hydrant "has been turned so that an outlet points toward the sidewalk." In addition, the comments on the stability of the vegetation seem repetitive. Finally, while automobiles and trucks are often an integral part of the landscapes portrayed on the photos of both eras, there is little comment on their change in design, function, or country of manufacture.

But these criticisms are small. The Vales have produced a book that is a welcome addition to the literature of geography and landscape evolution. It is well written and deserves to be read and enjoyed by those who have traversed various segments of U.S. 40, as well as armchair geographers around the world who enjoy vicarious travel and perceptive analysis. Stewart would have liked it!

Charles W. Collins, chairman of the department of geosciences at UW-Platteville, has edited a series of state atlases and published in geography and geomorphology.

RHETORICAL POETICS, THEORY AND PRACTICE OF FIGURAL AND SYMBOLIC FRENCH LITERATURE

by Donald Rice and Peter Schofer. Madison: The University of Wisconsin Press, 1983. 243 pp. $22.50.

By Gervais Reed

Almost everybody who reads literature seriously in any language has grappled with how we read. The writer creates an object of his experience that occasions communication to the reader. How does this process take place? What sort of mechanisms does the writer set up? What happens in the reader's mind as he reacts to the literary work? What choices and connections does the reader make as he interprets a text? These kinds of questions have in recent decades interested critics like the late Roland Barthes in France or Wolfgang Iser and Stanley Fish in this country. While some critics have been tempted to make reader-oriented or recreative criticism itself the object of inquiry, Donald Rice, professor of French at Hamline University, and Peter Schofer, professor of French at UW-Madison, have wisely and appropriately retained literature as the object of their study.

Although Rice and Schofer take most of their examples from French prose and poetry, which they translate accurately, the theory of *Rhetorical Poetics* ought not to be limited just to the literature of France. Their point of departure is Roman Jakobson's essay of 1956, "Two Aspects of Language and Two Types of Aphasia." Jakobson observed the structure of languages and literatures—not only German, French, English, West Finnic, and Russian but also Biblical texts—that he reduced to two devices, metaphor and metonymy. If these two figures of speech can define the structure of many languages, Jakobson asked, why could critics not generalize the same principles to the literature written in those languages and others? For their part, Rice and Schofer increase Jakobson's operations from two to four. To metaphor and metonymy they add synecdoche and irony. Then they expand these tropes into a larger theory of associative processes of symbolization and figuration, *viz.* similarity, causality, inclusion, and opposition. They carefully (re-)define their terms, never underestimating in their analyses the complexity of the act of reading and often reiterating and refining the thought of earlier critics to formulate their "rhetoric of the signifier." They borrow from Freud the notions of displacement and condensation, and while in no way denying the influence of psychoanalysis on literary study in this century, shift the perspective away from psychoanalysis to rhetoric. The unconscious acquires prominence in their theory of conscious reading: "A reader cannot retain all of a text and must displace (unconsciously) to certain signs and to certain parts of the text. The very establishment of traces involves displacement from initial tropes and figures in the text to others not present before the reader's eyes" (p. 98). I wonder, however, why the trained reader, for whom Rice and Schofer are writing, would not consciously retain more memory of tropes than they allow. I would argue that in reading traditional texts like *La Duchesse de Langeais* by Balzac, which they cite as an example of forgetting, displacement is a possibly more conscious act in reading literature than in Freudian interpretation of jokes and dreams. Admittedly, writers since Mallarmé have broken down literary conventions; arguably, however, a reader approaches a traditional text with the conscious awareness that comes from the reading of authors like Balzac. A classical text may control the act of reading to a consciously thoughtful act. On the other hand, a contemporary text throws those controlled processes into question, opening the text to multiple readings. In fact, Rice and Schofer's own interpretations minimize the importance of the unconscious in reading. Both closed and open reading depend on the reader's imagination and intelligence, a process that the authors understand, articulate, and enjoy.

Their theory leads them to demonstrate in four interpretive essays what Barthes calls "le plaisir du texte." Reading Balzac's *La Duchesse de Langeais*, they follow Jakobson's axiom that a novel is metonymic but find that metonymy offers only a partial understanding. With the discovery of synecdochal functions in Balzac's protagonists, Rice and Schofer extend their interpretation to reveal a sociopolitical dimension in the novel. In their essay on "Les Bijoux" by Baudelaire, they show how much previous critics have assumed. From their close analysis of causal or metonymic relationships in the poem emerges its ambivalent character that generously they choose not to resolve. They are comfortable with what they call "ironical dispersion." The authors treat the two versions of Mallarmé's "Le Pitre châtié" as discrete poems and avoid seeking a single interpretation of the later version. They choose instead to understand how it produces meanings. Their detailed list of "traces," which result from displacement and condensation, suggests possible links, some of which the reader chooses to retain, others of which he opts to disregard. Any act of interpretation involves selection, they argue; any selection implies other acts of selection. The essay on Mallarmé serves as transition from traditional French literature to modern poetic language. Having juxtaposed the two versions of "Le Pitre châtié" as instances of traditional and modern literature, the authors compare Balzac's traditional novel with a French New Novel by Claude Simon. They lay out the three discontinuous narratives of *Leçon de choses*. With evident pleasure they puzzle over Simon's "rhetorical subversion" to arrive by rhetorical processes at a solution from which they draw two "lessons" about contemporary literature. First, the generative theory of writing "frees the writer from the constraints of expression, representation, *a priori* meaning." Second, the New Novel forces the reader to retrace the writer's work, to extend his use of rhetorical processes to the signifier "where he begins to play with the multiple possibilities involved in the exchange between signifiers and signifieds" (pp. 209–10).

Rice and Schofer use the language of linguistics and assume that their reader possesses at least an elementary understanding of the science of language. They use the name Saussure (p. 72) and the derivative adjective "Saussurian" (p. 20), yet the eminent Geneva linguist does not appear in the index. Use of terms like "polysemia" and "diegetic" call for definition where there is none. But I cavil. The arguments of this admirable and well-printed book fall within the range of any serious reader of literature.

Gervais Reed, professor of French at Lawrence University, has written Claude Barbin: libraire de Paris sous le règne de Louis XIV *(Geneva: Droz, 1974) as well as articles and papers on Molière and Corneille.*

ROMAN CITIES

by Pierre Grimal, translated and edited by G. Michael Woloch. Madison: The University of Wisconsin Press, 1984. 355 pp. $30 cloth, $12.50 paper.

By Robert C. Ross

Michael Woloch has put together a marvelously useful vademecum for the scholar of classical Roman civilization; whether his compendium will be usable by the general reader, as he hopes, is a matter I should hesitate to affirm. The basis of this book is a translation of Pierre Grimal's slight but scholarly *Les villes romaines*. I say slight because the book originally appeared in the French series "Que sais-je," and this series has strict limits on the size and format of all its volumes. The books in this series are also directed to the general reader, and it is fortunate that Grimal wears his scholarship lightly. That is no small reason for the charm of what is really an extended essay on Roman cities in many of their aspects of the Western Empire and North Africa.

The translation of Grimal's clear, colloquial French is on the whole very good and usually readable. Most of the time Woloch has managed to capture the spirit and meaning of the text, but there are some infelicitous moments: e.g., "become exact to a degree what had never been expected" (page 6, for "au dela de tout espoir"), "veteran soldiers" (page 10, for "anciens soldats"—the reader should compare the discussion on page 336, s.v. colonia), "makeshift" used as a noun (page 37, where French "pis aller" should be kept in the English), and finally, "There also, not *a priori*, no preconceived theory hindered the free play of geographical laws" (page 89). The text reads like a translation and that takes away from some of the pleasure the essay ought to engender in the reader.

Readers should take the time and effort to read Woloch's notes to Grimal's text as they are invaluable. I found the information in them up to date and accurate; with the exception of the one on the Servian Wall—no. 4, page 99—they are commendably clear as well. I think that Woloch should have provided some note on Grimal's ideas on the triumphal arch (page 80), and Aristotle and Hippodamus (page 22), at least if he really means for the book to be used by lay readers.

If the translated text is the basis of the book, its heart—and the reason this book will be on the shelf of every scholar of Roman civilization—is the gazeteer of places mentioned in Grimal's text. Two thirds of the book is taken up by this "Descriptive Catalogue of Roman Cities," containing the seventy-eight cities of the Western Empire and North Africa mentioned in the translated text. These are each given a brief, synoptic history, often rather discursive and not at all limited to classical antiquity (e.g. Bologna, Orange), as well as information about the current state of excavations and museums (sometimes bordering on the guidebook style, e.g. Cherchell, Italica, Jijel). Under Osuna we are given a large portion of the famous Osuna colony charter, a unique document indeed, for no compelling reason so far as I can tell other than because it is not generally available in translation and its intrinsic interest. In any case this catalogue includes full bibliographies—to be ignored by the general reader according to Woloch—for each city; even the inscribed fibula from Praeneste has an entry of its own. This is a wonderfully valuable section of the book. One wishes for something like it for the Eastern Empire.

The master bibliography is followed by the most problematical part of the book, a "Glossary." In it Wolach, I think, tries to cover everything that a nonexpert would be conceivably perplexed by, but even as I write this I can't be certain. There are excellent notes on technical Roman terms, especially those with legal meanings. On the other hand Cisalpine Gaul is inadequately described; the diagram of the siphon does not explain how it works. The reader who needs help on "Etruscans" and "Byzantine," the former a brief history, the latter a ludicrous couple of sentences, is going to need help with much more in the book, for example Delos and the Cyclades. There are other, similar problems with this part of the book.

This leads to the basic drawback to the book as a whole. The reader who assiduously reads Woloch's text will find himself constantly flipping pages, especially Woloch's general reader who will have to use the master bibliography for the abbreviations and the glossary for definitions. The hardbound edition is well sewn and the paper stout, but the paperback volume will fall apart in time—quite apart from the exasperation that always accompanies constant page turning. I don't know if there was a way to avoid this, but I think that incorporating Woloch's footnotes to Grimal's text on the text page would have been a first move. In any case the reader should be prepared to work at reading this book.

The University of Wisconsin Press has given this book excellent proofreading and editing. I have found only two modest errors which the reader can easily correct for himself. The book is a welcome addition to the "Wisconsin Studies in the Classics" series.

Robert C. Ross is an associate professor of classics at UW-Milwaukee.

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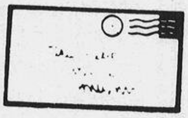
Letters



Dear Editor

I was amused at Herbert Kubly's complaint about not being included in the 1977 State of Wisconsin Bluebook as one of Wisconsin's "annointed nine" or great Wisconsin writers. I stumbled upon their names in the Bluebook when I started some research on Wisconsin writers. A few I had never even heard of, and I read extensively. What amused me, was that I, in a sense, share Kubly's disagreement with the categorizing of who's a great Wisconsin writer. My disappointment goes back to the 1960s when I muffed a chance to appear in the "Wisconsin Harvest" edited by August Derleth. Last fall when I joined the Academy and sent in an informal essay about Wisconsin, I had it returned with the cold remark that this highly literary magazine does not publish informal essays. So to Kubly I say, "Don't feel bad about the Bluebook listing, there are many of us Wisconsin writers out here, who have been waiting for decades to be annointed or knighted or something.

Helen Ouimette
Neillsville

I have just finished reading the June issue. I was deeply touched by the "Pictures of Em" and found it very easy to relate to the heroine in "A Daughter's Heart" and to the hero in "The Race." The work of Professor Louie Crew, "Professors Often Cause Bad Writing," impressed me. I shall have a Xerox copy of his article circulated among my fellow teachers. Several of my colleagues will admire Crew's essay, because they have been concerned with some very poor writing exhibited in chemistry laboratory reports. I look forward with pleasant anticipation to your September issue.

Peter Muto
UW-River Falls

Authors

continued from page 2

Signe Skott Cooper,R.N., M.Ed., is professor emeritus, who served on the UW-Madison School of Nursing faculty for thirty-five years. During much of that time she held a joint appointment with UW-Extension, directing the statewide continuing education program. She is a fellow in the American Academy of Nursing. **Emily B. Campbell**, R.N., M.S., is professor of nursing and has been on the UW-Madison faculty since 1964. She was project director of the Nurse Practitioner Training Grant from 1975 to 1984 and is currently project director of the Teaching Nursing Home Program funded by the Robert Wood Johnson Foundation.

Rima D. Apple, a fellow at the Women's Studies Research Center, UW-Madison, writes and lectures on the history of medicine. She recently published the *Illustrated Catalogue of the Slide Archive of Historical Medical Photographs at Stony Brook, Center for Photographic Images of Medicine and Health Care.* She is working on a history of infant feeding in the United States. **Judith Walzer Leavitt** is associate professor of the history of medicine, history of science, and women's studies at UW-Madison. She has edited *Sickness and Health in America* (with Ronald L. Numbers) and *Women and Health in America.* She is the author of *The Healthiest City: Milwaukee and the Politics of Health Reform* and the forthcoming *Brought to Bed: Women and Childbirth in America, 1750-1950.*

G. Stanley Custer, a retired gastroenterologist, is now archivist of the Marshfield Clinic. He received his undergraduate and medical degrees from the University of Wisconsin and completed his internship at St. Joseph's Hospital in Marshfield, where he was on the staff for many years. Dr. Custer was on the staff at Marshfield Clinic from 1944 to 1984.

Richard D. Sautter received his B.S. from the University of Nebraska-Lincoln and M.D. from the University of Nebraska-Omaha. He served his internship at Highland Alameda County in Oakland, California, and his residency at the University of Iowa. He joined the Marshfield Clinic in 1961. Dr. Sautter is executive director of the Marshfield Medical Foundation and director of medical education and a cardiovascular thoracic surgeon with Marshfield Clinic.

Harold P. Rusch received his M.D. from the University of Wisconsin Medical School and spent a year of internship at the University Hospital. He joined the UW physiology faculty and was appointed Bowman Fellow in cancer research. He became professor of oncology, director of the McArdle Laboratory for Cancer Research (1946-72), and director of the Wisconsin Clinical Cancer Center (1972-79). He served as president of the American Association for Cancer Research and the Association for American Cancer Institutes and editor-in-chief of *Cancer Research* from 1950-65.

Sigurd B. Gundersen, Jr., has been a general surgeon at Gundersen Clinic, Ltd., for the past thirty years and has served as president of the clinic since 1979. During his years as president, he has maintained a part-time medical practice. Gundersen received his M.D. degree from Harvard Medical School in 1948 and completed an internship and a residency at Massachusetts General Hospital, Boston, in 1949 and 1954, respectively. Gundersen is a fellow of the American College of Surgeons and a member of the Wisconsin Surgical Society, the Wisconsin State Medical Society, and the American Medical Association.

Patricia Mitchell has been a writer/editor and public information representative at the Waisman Center since 1981. Previously, she worked as a publications editor for the UW Sea Grant Institute. She received a B.A. in psychology from the UW-Madison in 1969.

Donald E. Percy is president and chief executive officer of the Jackson Clinic, a multispecialty clinic in Madison. He previously served as secretary of the Wisconsin Department of Health and Social Services under two governors (1977-82). Prior to that he was senior vice president of the University of Wisconsin System and executive vice president of the premerger University of Wisconsin. He currently has an appointment as a clinical professor in the UW department of preventive medicine and teaches in the medical school and business school.

Paul Nannis is executive director of the 16th Street Community Health Center in Milwaukee and chairperson of the executive committee of the Wisconsin Primary Health Care Association. **Kathleen Farnsworth** is the executive director of the Wisconsin Primary Health Care Association.

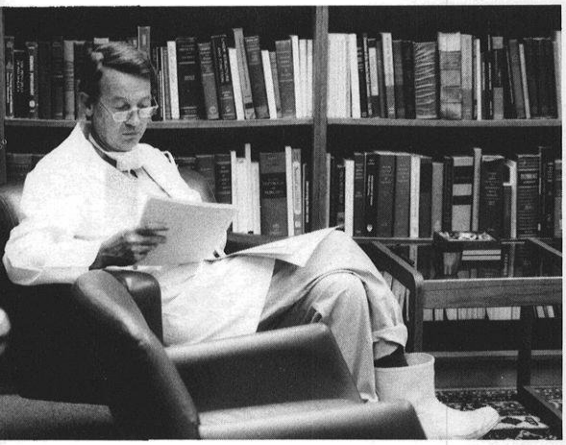
Ralph Andreano is professor of economics at UW-Madison, where he has taught since 1965. He has written books and articles in professional journals and has a weekly commentary on the state public radio station. Andreano was chief economist for the World Health Organization in the early 1970s and has continued to consult for WHO, the World Bank, PAHO, and other United Nation agencies. He was elected to the National Academy of Sciences and the Institute of Medicine. He was administrator of the state Division of Health from 1976 to 1978.

Raymond Kessel, who was born in South Africa, came to Madison in 1968 after spending five years in Israel. He completed his graduate training in plant breeding and genetics at the University of Wisconsin. For several years he taught undergraduate courses in the department of genetics and in integrated liberal studies. After a two-year fellowship in Israel he returned to Madison for retraining in clinical genetics. Since 1979, he has been coordinator of the Statewide Genetics Services Program.

Renata Laxova is professor of medical genetics and pediatrics at UW-Madison. She received both her M.D. and PH.D. degrees from the University of J. E. Purkynje, Brno, Czechoslovakia, and part of her training in medical genetics in Great Britain. She has been at the University of Wisconsin since 1975 and is the director of the Wisconsin Clinical Genetics Center.

James F. Crow is senior distinguished research professor of genetics at UW-Madison, where he has taught since 1948. His research interests are theoretical population genetics and Drosophila genetics. He is a member of the National Academy of Sciences and an Honorary Foreign Member of the Japan Academy. He was elected fellow of the Wisconsin Academy of Sciences, Arts and Letters in 1983. An Academy member since 1979, he is serving a four-year term as councilor at large. His hobby is music, and he plays viola in the Madison Symphony Orchestra.

Folkert O. Belzer



Folkert O. Belzer has been chairman of the UW-Madison department of surgery since 1974. He received a B.A. from Colby College in chemistry, an M.A. in biology from Boston University, and an M.D. from the Boston University School of Medicine. He has held visiting professorships in South Africa, Yugoslavia, and Australia as well as at numerous university hospitals and clinics in this country. He frequently writes on transplantation for professional journals.

Hans W. Sollinger is associate professor in the UW-Madison department of surgery. He received his M.D. and Ph.D. from the University of Munich, Germany. His research interests are in transplantation immunology, pancreas transplantation, and tissue typing.

Bernice Durand and her husband Loyal Durand are both theoretical physicists at UW-Madison. They own a house in Aspen, where she is a trustee of the Aspen Center for Physics, and where they take an annual two-week break to ski. In the summer of 1981, her brother gave her a kidney. The genetic disease and the transplantation is the subject of this article. The Durands have been Wisconsin Academy members since 1978.

Paul P. Carbone has been director of the Wisconsin Clinical Cancer Center since 1979. He received his M.D. degree from Albany Medical College in New York and served his internship and residency at U.S. Public Health Service Hospitals in Baltimore. His work in cancer research began at the National Cancer Institute in 1960 as senior investigator of the medicine branch. He became chief and in 1972 associate director for medical oncology in the Division of Cancer Treatment at NCI. He has received the Lasker Award for Clinical Cancer Chemotherapy (1972) and the Resenthal Award for achievement in Clinical research (1977). He has seven children, three of whom are physicians. Dr. Carbone and his wife have been Academy members since 1982.

Richard M. Pauli is assistant professor of pediatrics and medical genetics at UW-Madison. He received both his M.D. and Ph.D. (genetics) degrees from the University of Chicago. Postdoctoral training included pediatric residency at Children's Orthopedic Hospital and Medical Center in Seattle and the University of Washington and medical genetics fellowship training at the University of Washington. He has been at the University of Wisconsin for four years and, among other responsibilities, is the director of the Wisconsin Stillbirth Service Project. His interest in the genetic causes of stillbirth began with the stillbirth of his son, Zachary, five years ago. **Catherine A. Reiser** is a specialist in the UW-Madison departments of pediatrics and medical genetics.

Wayne H. Thompson is professor of preventive medicine at UW-Madison. He holds a D.V.M. from Iowa State University, an M.P.H. from the University of Minnesota, and a Ph.D. from the University of Wisconsin. Since joining the University of Wisconsin faculty in 1960, he has been chief of the university's zoonoses research laboratory, specializing in studies of mosquito-borne encephalitis. He and his wife Violet live in Madison.

John R. Cameron, chairman and founder of the department of medical physics at UW-Madison, holds a B.S. from the University of Chicago in mathematics and an M.S. and Ph. D. from the University of Wisconsin in physics. He has served as president of the American Association of Physicists in Medicine, the Central Chapter Society of Nuclear Medicine, and Radiation measurements (a nonprofit corporation). He was presented the Wisconsin Academy Citation in 1979.

Coming up in the Wisconsin Academy Review

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Funding for
this issue on health care in Wisconsin
was provided by the
Norman Bassett Foundation
Madison, Wisconsin

WISCONSIN ACADEMY REVIEW

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