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The equation of one part Harvard, one part MIT, one part hope, and one part perseverance has yielded the Harvard-MIT Division of Health Sciences and Technology

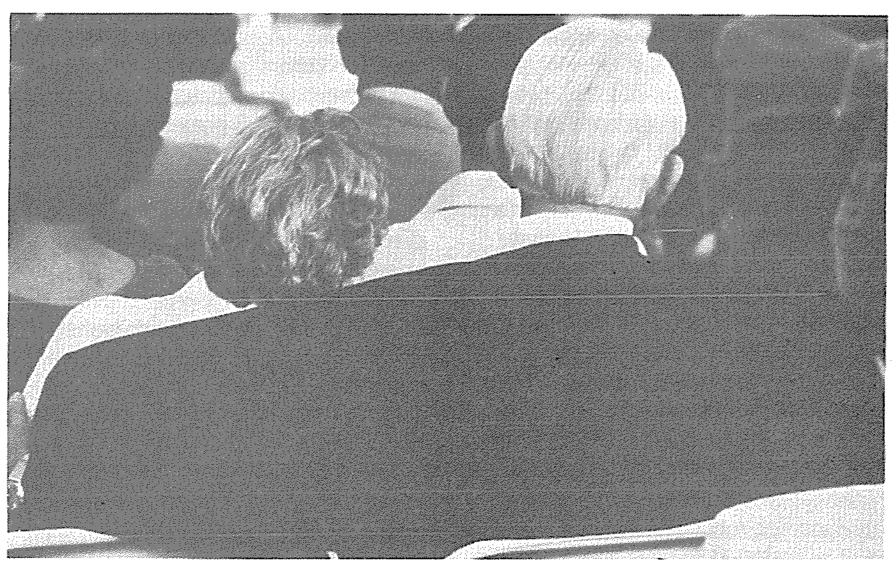
Partners across the river

by Irving M. London

The Harvard-MIT Division of Health Sciences and Technology is the product of the evolutionary development of collaboration, beginning early in this century, between Harvard Medical School and the Massachusetts Institute of Technology. In 1912, under the leadership of Milton Rosenau and George Whipple of Harvard Medical School, and William Sedgwick of MIT, the two universities established the Harvard-MIT School for Public Health Officers, a school which flourished for ten years and then became the Harvard School of Public Health. After World War II there was a marked increase in collaborative research involving especially physicists and engineers of MIT and physicians and surgeons in the Harvard teaching hospitals. An important example of such research was the earliest use of radioiodine in diagnosis and treatment of thyroid disorders by Robley Evans of MIT and Jacob Lerman and James Howard Means of the Massachusetts General Hospital.

In 1966 there was a significant acceleration of the pace of interaction when Dr. James Shannon, then director of the National Institutes of Health, urged that MIT establish a medical school based on its strengths in the natural sciences and engineering, and indicated that the NIH would provide support of at least fifty million dollars toward this objective. In 1966 this was an extraordinarily tempting proposal. Howard Johnson, the newly elected president of MIT and Jerome Wiesner, the provost, explored this possibility and concluded that MIT should not seek to establish a medical school. It was clear, however, that there was strong interest among faculty members in engaging in medical education and research and in increasing MIT's already significant strengths in the life sciences.

At the same time at Harvard Medical School, faculty members, especially David Rutstein, were emphasizing the importance of bringing to medical care, research, and education the strengths of engineering and the physical sciences. Dr. Robert Ebert, the new dean at the Medical School, recognized the merit of this suggestion and sought the help and advice of Jerome Wiesner. It appeared to them and to President Pusey of Harvard and President Johnson of MIT that it would be desirable to explore in depth the opportunities for mutual efforts of the two universities in education, research, and health care. Accordingly, beginning in January 1967, a Joint Committee spent two years exploring the wide range of possibilities for productive cooperation and then enthusiastically recommended the formation of a Planning Committee charged with the development of a detailed design. The Planning Committee stated that the objectives were to realize the benefits of science and technology in relation to human health needs by the joint application of the complementary resources of the two universities.



A central theme was the recognition that the advancement of scientific education and research is essential to progress in the maintenance and restoration of health and in the diagnosis and treatment of illness. Such a truism becomes meaningful at a time when an opposite anti-intellectual view has gained support in some medical schools. Stated simply, our Planning Committee held that the need was for more science, not less. Another principal theme was the realization that solving important problems of health often requires the concerns and competences not only of the biological sciences and the medical professions, but also of other disciplines and professions such as the social and behavioral sciences, engineering and the physical sciences, management, public administration, and law. Therefore, not only more science but more kinds of science are needed.

The Planning Committee proposed the establishment of a joint university institution designed to promote the productive interaction of biology and medicine with these other scientific disciplines and professions and to integrate education for health and medicine into general university education. This proposal, adopted by the Faculty of Medicine and the Faculty of Public Health at Harvard and by the Faculty of MIT, was endorsed by the Corporations of the two universities in the spring of 1970. There was agreement that new funds should be raised to support this enterprise and that in the meantime the collaboration would be formally established as the Harvard-MIT Program in Health Sciences and Technology. I should like to provide a report on the progress that has been achieved during the past eight years.

A new curriculum in the biomedical sciences leading to the M.D. degree awarded by Harvard Medical School has been evolved. It attempts to develop the interface of medicine with the natural sciences and engineering and to foster an informed understanding of the social and human implications of health activities. It seeks to afford curricular flexibility and richly diversified educational opportunities that are appropriate to the interests, talents, and aspirations of each student, and it is designed to promote continuity and coherence in the educational experience. The program is oriented toward students with a strong interest and background in quantitative science, especially in biology, physics, engineering, and chemistry. The innovative courses in human biology represent the joint efforts of life scientists, physicians, physical scientists, and engineers selected from the faculties of both universities, and the courses are presented at both schools.

Twenty-five students are admitted each year as candidates for the M.D. degree. They are selected by an Admissions Committee composed of faculty members from both Harvard and MIT, which serves as a subcommittee of the Admissions Committee of the Medical School. During the past few years, there have been approximately 400-450 applicants for the twenty-five positions. The records of accomplishment of the successful applicants, and of a large number of those who are not admitted, are quite remarkable. Approximately half of the students come from Harvard College and MIT; the rest from other universities throughout the country.

Each student is encouraged to pursue advanced study in areas of his or her interest that may complement the courses offered in this curriculum. Such study may be undertaken as part of the curriculum leading to the M.D. degree or may be pursued in a combined M.D.-master's degree or M.D.-Ph.D. degree program. All of the students are expected to engage in independent study under the supervision of one or more faculty tutors, and to write a thesis based on laboratory research, clinical investigation, and critical analysis of a significant medical problem approved by the faculty tutors. Currently, of approximately one hundred students in residence, thirty are enrolled as candidates for both the Ph.D. and M.D. degrees. The fields of graduate study include the various biological and medical sciences as well as applied mathematics, physics, various branches of engineering, biological anthropology, economics, and the history of science.

These students take the clinical clerkships along with their classmates in the regular medical curriculum. Our experience to date has shown that on the

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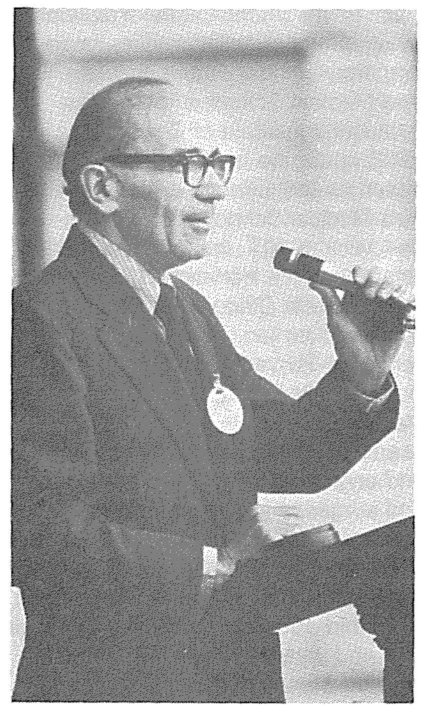
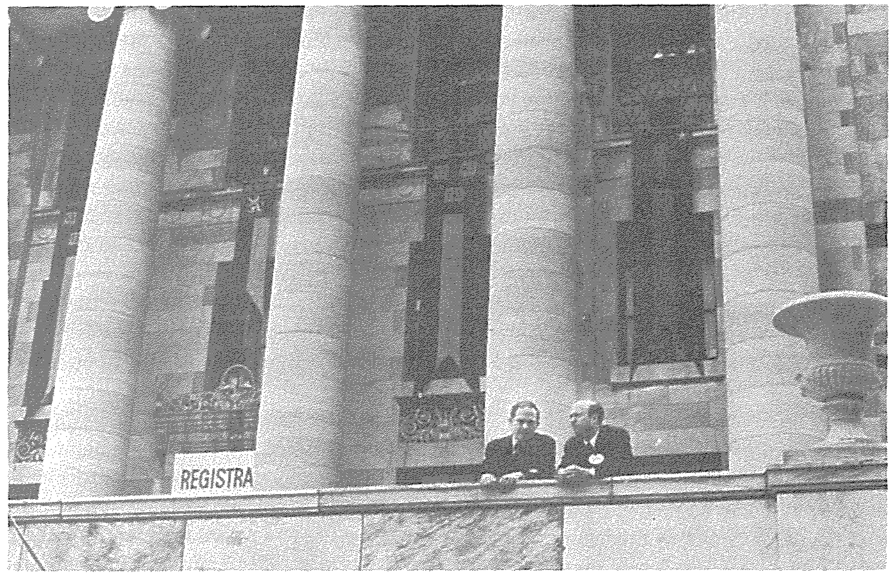


whole these students have excelled not only in the basic medical sciences and related disciplines, but also in clinical medicine. They have been highly successful in the competition for excellent internship and residency positions as well as for various post-doctoral research fellowships. Although it is too soon to have definitive information on the career paths which these students will follow, it appears that a large proportion is headed for academic clinical medicine, the basic medical sciences, and family care and primary care programs.



The second major educational program leads to a Ph.D. or D.Sc. degree in medical engineering or medical physics, and is under the direction of professor Ernest Cravalho. This program, which begins in September, has the objective of educating individuals who will be well qualified as engineers or physicists, have an extensive knowledge of human biology and medicine, and be prepared to engage in clinical investigation on important medical problems. They will contribute to the profession of medical engineering and medical physics, focusing on the application of science and technology to clinical medicine and the organization and provision of health services. The curriculum will be a five year program. During the first two years, students will complete the requirements for a master's degree in physics or engineering and also take a large proportion of the preclinical courses offered in the curriculum leading to the M.D. degree. In the third year they will be engaged in four clinical experiences, a required one in medicine, with the other three to be selected from a number of clinical opportunities in various fields. They will participate in both patient care and clinical research under the supervision of teams of physicians or surgeons and engineers or physicists. At the end of the third year they will begin doctoral research under the supervision of Harvard and MIT faculty members. This research will normally be completed by the end of the fifth year.

Approximately ten students are going to be admitted each year, and we are optimistic that the program will attract individuals of the highest quality and that they will make important contributions to the solution of major clinical problems both as engineers or physicists and as knowledgeable medical scientists. We hope, too, that a significant aspect of their training will be the ability to evaluate the consequences of technologic intervention so that the applications of science and technology to health needs will be judiciously determined.

A companion educational program, directed by Professor Laurence R. Young is interdepartmental and leads to a doctoral degree in biomedical engineering. Its emphasis on the basic life sciences is considerably greater than that found in bioengineering programs in departments of engineering. Twelve students are currently enrolled as doctoral candidates. A fourth program in medical radiological physics concentrates on education and training in the physics of radiation therapy, diagnostic radiology, and nuclear medicine, and leads to a doctoral degree at MIT or at the Harvard School of Public Health. The directors are professors Bengt Bjarngard, Gordon L. Brownell and Edward W. Webster.

These various educational programs have brought forth forty new courses, among them functional anatomy of man, quantitative physiology, the full range of pathophysiology, the human nervous system, the molecular basis of clinical disorders, ethics and decision making in medicine, and the economics of health care. In addition, a sequence of rigorous courses in physics with illustrations from biology and medicine has been successfully introduced for undergraduates at MIT.

In the field of research we have focused on major health problems that are especially suited to the complementary strengths and talents of faculty members and students. Multidisciplinary investigative programs, many engaging thirty or more faculty members, have been established in the fields of biomaterials and thromboresistent materials, the study of metabolic disorders with new nuclear techniques, and the enhancement of dose distribution in radiation therapy of cancer. A Rehabilitation Engineering Center for patients with various musculoskeletal disorders has been created at both Children's Hospital Medical Center and MIT under the leadership of Drs. William Berenberg, Melvin Glimcher, and Robert Mann. A national center for clinical instrumentation based on new microprocessor technology has been established and is being administered by Dr. Roger Mark. The most recent of these research programs is that concerned with the health effects of fossil fuel combustion and utilization, a subject of great importance as the search for new sources of energy turns increasingly to coal. This program, led by Professors Gerald Wogan and Jean Louis, seeks to determine the biological effects of the products of various methods of combustion in order to guide the technology, minimizing environmental health hazards. Currently under development is a program of research on learning disabilities in children that will join pediatricians, neurologists, physiologic psychologists, and linguists. In this undertaking we hope to develop an understanding of these disorders — which are extraordinarily prevalent in our society and involve at least ten per cent of our school children — leading to effective diagnostic methods, preventive measures, and successful therapeutic intervention.

Having demonstrated that two autonomous universities can join productively in common educational and research efforts, and with some success in raising endowment and operating funds, the respective Corporations have institutionalized the Program in Health Sciences and Technology as the Harvard-MIT Division, which cuts across departmental and school lines. Its governing board is composed of both presidents and two corporation members of each university. Its principal policy making group is the joint faculty committee composed of senior faculty members of Harvard Medical School, the Faculty of Arts and Sciences, the Faculty of Public Health, and MIT. An administrative council composed of the deans of the relevant faculties is the liaison in promoting efficient utilization of human and physical resources. Approximately one hundred faculty members hold joint appointments.

With the establishment of the Harvard-MIT Division, MIT has now taken the additional step of organizing within its faculty the Whitaker College of Health Sciences, Technology, and Management. This college is designed to provide an academic focus for the extensive health-related activities at MIT, which interestingly equal approximately one-third of the total research effort. Whitaker College will encompass the MIT components of the Harvard-MIT Division and will also include educational and research programs in human genetics, behavioral biology, environmental biology and toxicology, human physiology and experimental medicine, and health care policy and management. The closest integration of the Harvard-MIT Division and Whitaker College will be achieved.

Finally, a word on experimentation in medical education. When the experiment involves joining two large, complex, and successful universities with rather different traditions and lifestyles, the challenges are many. Successful institutions are often justifiably conservative and resistant to change. We have been most fortunate during the past twelve years that the leadership has been creative and supportive of this new enterprise. President Johnson and President Wiesner of MIT, President Derek Bok, Professor Walter Rosenblith, the Provost of MIT, Dean Robert Ebert of Harvard Medical School and his associates Henry Meadow and Dr. Robert Blacklow, Dr. Eleanor Shore, assistant to President Bok, and now our new Dean, Daniel Tosteson and his associates, Drs. Daniel Federman and James Adelstein have provided and continue to provide a climate conducive to successful innovation. The enthusiastic participation of faculty members who are willing to assume the heavy responsibility of promoting these interdisciplinary educational and research programs has been crucial. In this effort, Dr. Walter Abelmann who serves as chairman of the Board of Tutors and co-chairman of the Curriculum Committee, Herman Eisen, who is chairman of the Admissions Committee and co-chairman of the Curriculum Committee, and Ernest Cravalho who is associate director for medical engineering and medical physics have been especially productive. And then of course the students, gifted and talented as they are, have been a constructive force in curriculum development.

The further evolution of current programs, the interface with the social and behavioral sciences, and the development of educational offerings in human biology for undergraduates and graduate students at Harvard College and MIT are part of the agenda that has been drawn up for the years ahead.

Described by Dr. Federman as "the champion" of the Harvard-MIT Division of Health Sciences and Technology, Irving M. London '43A is professor of medicine and director of "what has become a beautiful departure for Harvard." Dr. London took part in the establishment of the Albert Einstein College of Medicine and served as chairman and professor, department of medicine from 1955 to 1968.