HST in perspective

A newsletter of the Harvard - MIT Division of Health Sciences and Technology

Summer, 1988

NEW MASTER'S DEGREE IN HEALTH SCIENCES & TECHNOLOGY FOR HST/M.D. CANDIDATES

The **HST** Division is committed to educating physicians who will also have a deep understanding of the scientific basis of medicine, and who are equipped for a career of interdisciplinary research. The Division already encourages students to spend time in research during their M.D. curriculum, and a thesis is required for the M.D. degree. Many students, however, desire to obtain more substantial research training than is possible in the current four year M.D. curriculum. One existing route for such students is to pursue a formal Ph.D. program in addition to the M.D. curriculum. A second option is now available which will stretch the duration of the M.D. Program to five or more years in order to permit the inclusion of a major research training component. The program leads to a new degree, the Master's Degree in Health Sciences & Technology, to be awarded in addition to the M.D. degree. The new Master's program was approved by the MIT faculty on May 18, and by the HMS faculty on May 19, 1988.

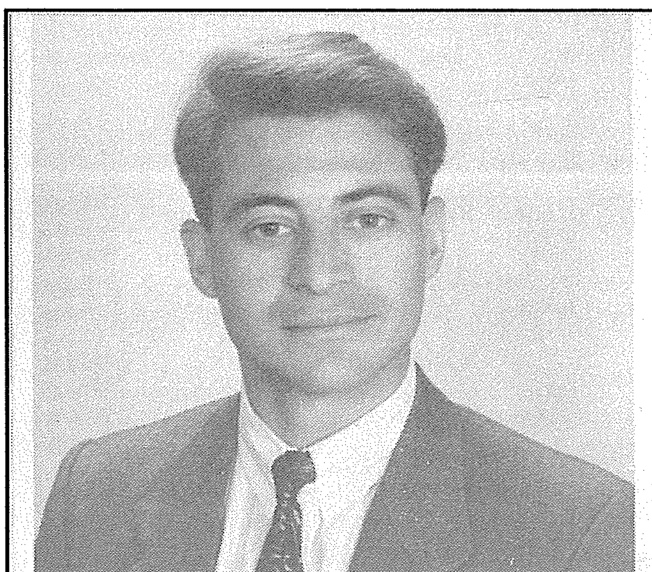
The requirements for this degree include the submission of a substantial thesis documenting original research, and also the completion of additional subjects in scientific/technical/clinical areas which are relevant to the student's research specialty. The master's degree program will be administered by the HST/M.D. Graduate Committee, a special subcommittee of the M.D. Curriculum Committee. The degree will be granted by either MIT or HMS depending upon the institutional affiliation of the research sponsor, and/or the request of the student.

Students enrolled in the proposed master's degree program would have sufficient research time available to work as full time research assistants, thus substantially support ing tuition and living expenses during their graduate education. Applications for the Master's Program will be available in September 1988 in the HST office at 260 Longwood Avenue.

Student News

HST STUDENT DIRECTS SPACE UNIVERSITY

Peter H. Diamandis (HST M.D.) has launched himself on a trajectory toward a career in space. The 27 year old HST student serves as director of the first session of the International Space University, now underway at MIT. ISU boasts 105 students from 20 nations who, from June 20 to August 20, are studying everything from space engineering to how to live together under stressful conditions. **(Continued on P. 14)**



1988 M.D. GRADUATES

Twenty six **HST** students received M.D. degrees in June. The class of 1988, the 14th in HST history , is listed in Table 1 along with the location and field of their internships.

Eleven of the 26 also received Ph.D. degrees; Table II gives their names and theses titles. M.D. candidates are also required to write theses, the titles and supervisors of which are given in Table III.

TABLE I **HST CLASS OF 1988 INTERNSHIPS**

NAME	HOSPITAL/LOCATION	FIELD OF INTERNSHIP	SUBSEQUENT RESIDENCY
Bernstein, Paul R.	NE Deaconess Hosp. Boston, MA 02115	Preliminary Med.	1 Year Research Fellowship Jules Stein Eye Inst. UCLA
Brodey, Benjamin	Framingham Union Framingham, MA 01701	Transitional	Psychiatry New Haven Hospital
Cheung, Luke P.	Newton Wellesley Hosp. Newton, MA 02158	Preliminary Med.	Radiology U. of Pennsylvania
Chung, Jay	Brigham & Women's Hosp. Boston, MA 02115	Medicine	Medicine
Cohen,* David	Brigham & Women's Hosp. Boston, MA 02115	Medicine	Medicine
Cohen Steven M.	Miriam Hospital Providence RI 02906	Transitional	Ophthalmology U.C. Davis
Eagon, John C.	Barnes Hospital St. Louis, MO 63110	Surgery	
Freed, Lisa	Internship postponed; received Fulbright Grant and Sheldon Travelling Fellowship		
Greenberg, Steven A.	Mass. General Hosp. Boston, MA 02114	Preliminary Med.	Neurology UCSF
Haigh, Linda S.	Brigham & Women's Hosp. Boston, MA 02115	Surgery	
Harbury , Lisa S.B.	Beth Israel Hospital Boston, MA 02215	Medicine	
Hey, Lloyd A.	Brigham & Women's Hosp. Boston, MA 02115	Surgery	
Lee, Raymond	Mass. General Hosp. Boston, MA 02114	Surgery	
Leong, Rebecca J.	Boston City Hospital Boston, MA 02118	Preliminary Med.	Anesthesiology Mass. General Hosp.
Levin, Leonard	Mt. Auburn Hospital Cambridge, MA 02238	Preliminary Med.	Ophthalmology Mass. Eye & Ear Infirm.
Liu,* Eugene	Beth Israel Hospital Boston, Mass 02215	Medicine	Medicine
McFarland, Eric	Santa Barbara Cottage Hosp. Santa Barbara, CA 93105	Preliminary Med.	Radiology Harbor,UCLA

Okada, Annabelle	Mass. General Hospital Boston, MA 02114	Preliminary Med.	Ophthalmology Mass. Eye & Ear Infirm.
Rogers, William O.	Portsmouth Naval Hospital Portsmouth, VA 23708	Medicine	
Saxberg, Bo E.H.	internship postponed; completing Ph.D.		
Senechek, David R.	Mt. Zion Hospital San Francisco, CA 94115	Internal Med.	
Sege, Robert	The Children's Hospital Boston, MA 02115	Pediatrics	
Spangler* Gregory	NYU Medical Center New York, NY 10016	Surgery	
Spencer, Richard	Faulkner Hospital Boston, MA 02130	Preliminary Med.	Radiology Duke
Stolpen, Alan	U. of Pennsylvania Hosp. Philadelphia, PA 19104	Preliminary Med.	Radiology
Tan, Swee Lian	New England Deaconess Hosp. Boston, MA 02115	Surgery	Radiology

*Graduated in November, 1987

TABLE II **CLASS OF 1988 HST M.D. - PH.D. CANDIDATES**

Student	Department/School	Thesis Title	Supervisor
Bernstein Paul R.	Pharmacology Harvard	"Biochemistry and Pharmacology of Rhodospin Regeneration in the Vertebrate Eye"	Robert Rando, Ph.D.
Chung, Jay H.	Genetics Harvard	"Regulation of the c-myc Proto Oncogene in Burkitt Lymphoma Cells"	Philip Leder, M.D.
Cohen, David E.	Physiology and Biophysics Harvard	"Studies of Biliary Lipid Secretion and Aggregation in Model and Native Biles"	Martin C. Carey, M.D. D.Sci.
Levin, Leonard	Neuroscience Harvard	"Immune Functions of Astrocytes"	Howard L. Weiner, M.D.
McFarland, Eric	MEMP MIT	"Nuclear Spin Transfer Studies of Chemical Reactions in Living Systems"	Martin Kushmerick, M.D., Ph.D.
Rogers, William O.	Cell and Develop. Biology Harvard	"Sequence Heterogeneity in the Kinetoplast DNA Minicircle of Leishmania and its Application to the Detection and Identification of Leishmania"	Dyann Wirth, Ph.D.
Saxberg, Bo E.H.	Physics MIT	A Theoretical Model For the Activity of the Heart (topic)	Richard J. Cohen, M.D., Ph.D.
Sege, Robert D.	Biology MIT	"Genetics Analysis of LDL Endocytosis: Molecular Characterization of Mutant and Revertant Cells"	Monty Krieger, Ph.D.
Spangler, Gregory J.	Exp. Pathology Harvard	Simian Virus 40 (topic)	David Livingston, M.D.

Spencer, Richard G.	MEMP MIT	"31p NMR Spectroscopy Studies of Cardiac Energetics and Function in the Perfused Rat Heart"	Joanne S. Ingwall, Ph.D.
Stolpen, Alan	Pharmacology Harvard	Cytokine Mediated Regulation of of Endothelial Cell Morphology and Membrane Dynamics (topic)	Jordan S. Pober, M.D., Ph.D.

TABLE III **CLASS OF 1988 HST M.D. THESES**

Student	Title	Thesis Supervisor
Brodey, Benjamin	"The Impact of AIDS on Large Massachusetts Based Corporations"	Steven Gortmaker, Ph.D. David Calkins, M.D.
Cheung, Luke P.	"Sodium and Water Suppressed Proton Nuclear Magnetic Resonance Spectroscopy of Normal and Neoplastic Tissues"	Deborah Burstein, Ph.D. Eric T. Fossell, Ph.D.
Cohen, Steven	"Y-79 Retinoblastoma Cells Have Receptors for Vitamin D and Their Growth is Inhibited by Vitamin D In Vitro and In Vivo"	Daniel M. Albert, M.D
Eagon, John (Chris)	"Quantitative Frequency Analysisof the Electrogastrogram During Prolonged Motion Sickness"	Charles M. Oman, Ph.D.
Freed, Lisa	"An Enzymatic Bioreactor Based on Suspended Particles of Agarose Immobilized Heparinase"	Robert S. Langer, Jr., Sc.D.
Greenberg, Steven	"Neurokinin A in the Feline Trigeminovascular System"	Michael Moskowitz, M.D.
Haigh, Linda	"The Role of Cholesterol in Regulating Muscarinic Cholinergic and Beta Adrenergic Responsiveness in Cultured Chic Atrial Cells"	Jonas B. Galper, M.D., Ph.D.
Harbury, Lisa	"<u>In situ</u> Hybridization to Diagnose <u>Leishmania</u>"	Dyann Wirth, Ph.D.
Hey, Lloyd	"Health Status and Health Care in Greater Boston Adolescent Emergency Shelters: New Opportunities for Health Providers to Join the Team"	Patricia McArdle, Ed.D.
Lee, Raymond	"Efficacy and Preliminary Toxicity Testing of a New Blood Substitute"	Gus J. Vlahakes, M.D.
Leong, Rebecca	"The Effects of Acupuncture on the Hormonal Response to Stress"	Bart Chernow, M.D.
Liu, Eugene	"Transferin Receptor Mediated Intoxication of Target Cells by Transferin CRM 45 Conjugate Toxin"	Terry B. Strom, M.D.
Okada, Annabelle	"The Contribution of Mitochondria to Calcium Homeostasis in Cultured Heart Cells"	Thomas W. Smith, M.D.
Senechek, David	"Lymphadenopathy and AIDS"	Donald Abrams, M.D.
Tan, Swee Lian	"Electron Spin Echo Spectroscopy of Ethanolamine B-12 Dependent Enzyme"	William H. Orme-Johnson, III, Ph.D.

1988 HST RESEARCH FORUM

The 1988 HST Research Forum will be held on Friday, October 28. The one day event features research presentations by **HST** students at the Whitehead Institute. At noon, a poster session and luncheon will take place at E25 119/121. There also will be an evening dinner dance at which the Irving M. London Teaching Award will be presented. To encourage participation by students and faculty, all classes have been cancelled on that day. The research presentations will be open to the public.

The Forum was initiated in 1987 to underscore the importance of research in the Harvard - MIT Division and to provide a way for faculty and students to learn about various projects underway. Approximately 40 papers were presented in 1987; this number is expected to increase in 1988. Copies of the Proceedings of the 1987 HST Forum are available from the **HST** Office at MIT.

Abstract forms have been mailed to students, and these were due by August 1. Authors will be notified whether their papers have been accepted as a poster or platform presentation in September. A four page paper describing the research is due in October. Papers will be compiled and published in the Proceedings of the 1988 HST Forum.

More information about registration and presentation format will be available in September. Meanwhile, questions can be addressed to Ms. Barbara Jaskela, MIT E25 -519, Cambridge, MA 02139;(617) 253-1554.

NEW RESEARCH DATABASE

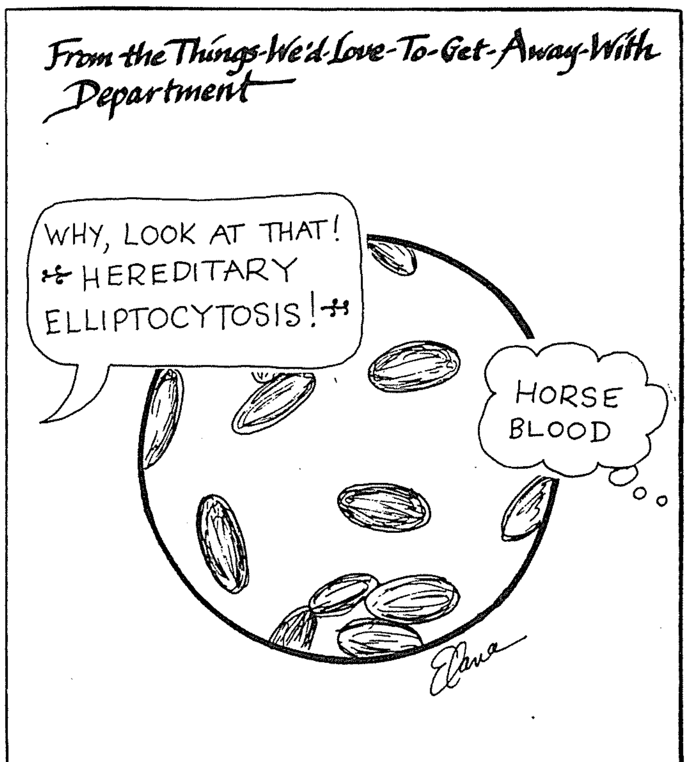
In order to assist new students to identify suitable research projects, **HST** has recently created a comprehensive computerized database containing research projects at Harvard and MIT which are funded through a variety of government agencies. This database permits students to search by investigator, project title, and key words. Interested students may contact Mr. Les Comeau (253 - 2862) for more information regarding this resource.

RESEARCH ASSISTANTSHIPS ARE POPULAR

The HST Research Assistantship (RA) Program for medical students appears to be a big hit with both students and faculty. The program is designed to encourage medical students to become involved in longitudinal research experiences in parallel with their medical studies. In addition to providing supervised research training, the RA Program also enables students to defray some of the costs of their medical education. Half time research assistants must commit a minimum of 10 hours per week to research, and in general may carry a nominal full time academic course load. Full-time research assistants must commit a minimum of 20 hours per week to laboratory work, and must correspondingly reduce their academic load.

During the past academic year, approximately 40% of first year students and 70% of second year students were research assistants. About 40% of these students worked in laboratories at MIT; and the remainder at laboratories at HMS and in the teaching hospitals.

The research interests of the class span a wide variety of topics ranging from bioengineering and biophysics to molecular biology.



Alumni News

M.D. ALUMNI SURVEY

The Harvard MIT Division of Health Sciences and Technology began enrolling students in 1971. Its lofty goal then, as now, was to "bring to bear on the education of physicians the full range of sciences basic to human biology and medicine." One way to assess this goal is to summarize the disciplines in which the graduates earned their degrees and identify the fields where they now teach, practice, and do research.

Irving M. London, M.D., Grover M. Hermann Professor of Health Sciences and Technology, HST, Professor of Medicine, HMS, and founding director of HST, undertook this task. Using mailed questionnaires, he surveyed the 246 alumni who graduated from HST from 1975 to 1984. (Graduates of more recent classes are almost all in training as residents or postdoctoral fellows.) Seventy percent or 172 alumni responded. This impressive response by a majority of alumni reveals that most of them (106) hold academic appointments. Twenty-eight are in fulltime practice, and 38 are in training. Most of those in the three categories are in medicine, surgery, or pediatrics.

Academic positions include one professor, 14 associate professors, 59 assistant professors, and 26 instructors. Clinical appointments in medicine top the list at 55. Pediatrics ranks second with 15 appointments. Surgery is next with 7, then come anesthesiology and neurology with 6 each. There are two graduates each in health policy, pharmacology, ophthalmology, and radiology. Individuals are scattered in fields that include biochemistry, bioengineering, dermatology, entomology, epidemiology, pathology, and virology. One graduate is an associate professor of health sciences and technology in HST. Another is a senior investigator in pediatric oncology at the National Cancer Institute. One associate professor specializes in health economics; one assistant professor teaches the history of science.

Of graduates now in fulltime practice, 4 each are in medicine and emergency medicine. Three each practice in pediatrics, radiology, and surgery. There are 2 each in administration, cardiology, and family medicine. Individuals practice in neurology, obstetrics-gynecology, pathology, and urology. Two alumni, one radiologist and one surgeon, serve in the U.S. Army; one works for an insurance company.

Of 25 post docs, 16 are in medicine. Two each specialize in surgery, pediatrics, and neurology. The remaining 3 have chosen family medicine, obstetrics gynecology, and pathology. Of 13 residents, 9 are in surgery, 2 in medicine and one each in obstetrics-gynecology and radiology.

The data show that 64 M.D.- Ph.D. degrees were earned from 1975 to 1987. Thirty one were in the biological sciences (22 from Harvard, 9 from MIT). Thirteen selected the Medical Engineering/Medical Physics (MEMP) Program. Five took degrees in biophysics (Harvard), and 4 in electrical engineering and computer science (MIT). The rest are scattered in physics (3), applied sciences, chemical engineering, chemistry, economics, history of science, mathematics, and anthropology.

Currently, there are 64 HST M.D.- Ph.D. candidates, and their choice of fields reflects that of the alumni. Thirty are in the biological sciences (19 at Harvard, 11 at MIT), 14 in MEMP, and 3 in biophysics. The rest are studying applied sciences, chemistry, electrical engineering and computer sciences, and physics.

Those interested in more detailed results of the M.D. Alumni Survey survey should contact Prof. Irving M. London, 253-4305.

MEMP ALUMNI SURVEY

As of January 1988, 24 individuals had earned the Ph.D. degree in Medical Engineering or Medical Physics. Of these, 13 also obtained the M.D. degree. A survey of these alumni was prepared for presentation to the HST Advisory Committee which met here in March 1988. The highlights of that survey are presented here.

Virtually all of the **MEMP** graduates are presently employed in academic or research positions. (See Table 1.) Six are faculty members in engineering or physical science departments at universities. Nine are faculty members in teaching hospitals associated with medical schools or at medical research foundations. Seven graduates are presently still involved in medical training (medical student, resident, or fellow). Two graduates are presently postdoctoral fellows. Interestingly, no **MEMP** graduate is currently employed in industry. Of the 17 graduates who are not in medical training status, 8 are employed in universities and 9 are working in medical or clinical facilities.

A large percentage of the graduates are actively involved in teaching. Ten of the 11 Ph.D. graduates are involved in teaching formal courses in engineering or physiology at the university level. Half of the 8 M.D./Ph.D. respondents are teaching, 2 in formal university courses, and 2 in clinical courses.

Graduates were asked to assess the impact of the medical and clinical portion of their formal training. All respondents felt that the medical and clinical experience had proven extremely helpful in their current positions. Eighty percent of the alumni felt that these courses were important in determining their career direction. The remainder had entered the **MEMP** Program with well-developed career goals.

TABLE I

MEMP GRADUATES, 1981-1987

NAME	GRADUATED	PRESENT POSITION
Jonathan Valvano, Ph.D.	Sept., 1981	Associate Prof., Department of Biomedical Engineering, University of Texas, Austen
Anthony Patriarco, M.D., Ph.D.	June 1982	Resident, Dept. of Pediatrics & Medicine, North Carolina Memorial Hospital
Tamar Yashin-Flash, Ph.D.	June 1983	Asst. Prof., Dept. of Applied Mathematics, Weizman Institute of Science, Rehovat, Israel
Dennis Orgill, M.D., Ph.D.	June 1983	Resident, Dept. of Surgery, Brigham and Women's Hospital Boston
Ronald Tompkins, M.D., Ph.D.	June 1983	Asst. Prof., Dept. of Surgery, Harvard Medical School; Asst. in Surgery, Dept. of Surgery, Mass. General Hospital, Boston
Jose Venegas, Ph.D.	June 1983	Asst. Prof. in Anesthesia (Bioengineering), Harvard Medical School; Asst. Biomedical Engineer, Dept. of Biomedical Engineering and Anesthesia, Mass.General Hospital, Boston
Edward Ingenito, M.D., Ph.D.	February 1984	Fellow, Pulmonary Medicine, Dept. of Medicine, Brigham and Women's Hospital, Boston

David Sebok, Ph.D.	February, 1984	Asst. Prof., Dept. of Radiology, R.W. Johnson School of Medicine, New Jersey
Bruce Rosen, M.D., Ph.D.	June, 1984	Instructor in Radiology, Harvard Medical School; Dir. of Clinical NMR, Dept. of Radiology, Mass. General Hospital; Lecturer in HST - teaches NMR Course
Joanne Donavan, M.D., Ph.D.	Sept., 1984	GI Fellow, Dept. of Medicine, Brigham and Women's Hospital, Boston
Elazer Edelman, M.D., Ph.D.	Sept., 1984	Fellow, Dept. of Cardiology, Brigham and Women's Hospital, Boston
Josep Valor-Sabatier, Ph.D.	June, 1985	Asst. Prof., Instituto de Estudios Superiores de la Empresa, Barcelona, Spain
David Carley, Ph.D.	Sept., 1985	Research Instructor in Medicine, Research Institute, Univ. of Illinois, College of Medicine at Chicago
Zvi Ladin, Ph.D.	Sept., 1985	Asst. Prof., Dept. of Biomed. Engineering, Boston University, Boston
Joseph Smith, M.D., Ph.D.	Sept., 1985	Post Doctoral Fellow, HST/MIT; Medical Intern, Brigham and Women's Hospital, Boston
Deborah Burstein, Ph.D.	June, 1986	Instructor in Radiology, Harvard Medical School; Research Associate in Radiology, Beth Israel Hospital, Boston
Edward Cheal, Ph.D.	June, 1986	Instructor, Harvard Medical School; Dept. of Orthopedic Surgery, Beth Israel Hospital Boston
Paul Albrecht, Ph.D.	Sept., 1986	Post Doctoral Fellow, HST/MIT, Dr. Richard Cohen's Lab
Martha Gray, Ph.D.	Sept., 1986	J.W. Kieckhefer Asst. Prof. in Medical Engineering, Dept. of EECS and HST; Assistant Biomedical Engineer, Biomed. Engineering & Orthopedics, MGH, Boston
Nancy Allbritton, M.D., Ph.D.	June, 1987	Post Doctoral Fellow, MIT with Dr. Eisen, Center for Cancer Research
Eric McFarland, M.D., Ph.D.	June, 1987	HST/M.D. medical student
Mark Saltzman, Ph.D.	June, 1987	Asst. Prof., Dept. of Chemical Engineering, Johns Hopkins University, Baltimore, MD
Robert Cothren, Jr., Ph.D.	Sept., 1987	Project Scientist, Research Institute, Cleveland Clinic, Cleveland, OH
Patrick Riley, Ph.D.	Feb. 1988	Technical Director of Biomotion Laboratory at Mass. General Hospital, Boston

MGH BIOMEDICAL ENGINEERING DEPARTMENT NEWS

On June 1, 1988, the Department of Biomedical Engineering, Massachusetts General Hospital, issued its first annual report covering the period March 1, 1986 to May 1, 1988. This period covers the first two years of operation as a formal affiliate of the Harvard-MIT Division of Health Sciences and Technology. This three way partnership between MIT, HMS, and MGH is a pioneering effort that: **(1)** addresses important problems in clinical medicine through the judicious application of technology; **(2)** supports this clinical effort with a vigorous program of research that will lead to the generation of new knowledge at the interface of technology and medicine; and **(3)** will educate a new breed of biomedical engineers whose strengths in the engineering and biomedical sciences are complemented with the knowledge and experience that only a clinical environment can provide.

Biomedical engineering is a young field of extreme breadth, still in its embryonic stages of development. In one way or another, biomedical engineering encompasses or intersects nearly all the engineering and physical sciences, the computer sciences, and a significant portion of the biomedical sciences as well. The body of knowledge embraced by biomedical engineering is extensive and its boundaries are not sharply defined; furthermore, the levels of education of the practitioners vary greatly. That is, biomedical engineers may hold bachelor's, master's, or doctoral degrees and still truly be regarded as biomedical engineers. The practice of biomedical engineering, of necessity, then becomes a team effort in which the team is comprised of individuals possessing different levels of expertise with strengths in diverse disciplines adequate to address the needs of technology in patient care. The composition of a department of biomedical engineering is therefore heterogeneous and changes with time as the field continues to evolve. The challenge facing this department is to unify this diverse group of professionals into an integrated, smoothly functioning whole capable of meeting the technological needs of the institution.


Ernest G. Cravalho, Chief

The faculty component of the department presents a special opportunity: that of drawing the doctoral level biomedical engineers out of the research laboratory and into the patient care areas on a part time basis in much the same pattern as the physician scientists of the medical specialty departments. In this way, this department is bringing to bear, on important clinical problems, the full range of talent available in the biomedical engineering profession. Consequently, the nature of the work takes on a distinctly developmental flavor with the implementation of these new technologies being led by biomedical engineers at the bachelor's and master's levels. Despite this academic influence, however, the primary clinical mission of this department remains unchanged: the development, implementation, and maintenance of technology for patient care.

This new enterprise is a challenge for everyone in the department, in the hospital, and in HST. Its success depends heavily upon the commitment that each and every one of us is able to make to it. Through a united effort, great benefits can accrue to medicine, engineering, to the hospital, and to **HST**, in particular.

Awards & Grants

JOHNSON & JOHNSON RESEARCH AWARDS ANNOUNCED

The Faculty Advisory Committee for the Johnson & Johnson Research Fund announced in mid April the successful applicants for funding under this innovative program. A total of 14 awards were made to faculty at Harvard and MIT. All investigators are supervising HST Research Assistants. A list of the principal investigators, student participants, and research titles are listed below.

JOHNSON & JOHNSON RESEARCH AWARDS 1988-89

Faculty Member/ Principal Investigator	Student Investigator	Title of Research
Dr. Peter Hess HMS/Physiology & Biophysics	Chinfei Chen	Voltage Sensitive Calcium Channels in Fibroblasts: Their Role for Cell Function & Relationship to Oncogenic Transformation
Prof. Thomas Weiss MIT/EECS	Donna Hendrix	Measurements of the Motion of the Tectorial Membrane
Prof. Phillip Sharp MIT/Biology	Robert Marciniak	Regulation of Alternative Splice Site Selection: A Study of the L1 Region of Adenovirus
Prof. Harvey Lodish MIT/Whitehead/Biology	Eugene Kaji	Transport of Secretory Proteins from the Endoplasmic Reticulum to the Golgi
Prof. David Page MIT/Biology	Jonathan Bogan	Deletion Mapping the Long Arm of the Human Y-Chromosome
Prof. George Whitesides HU/Chemistry	Ahamindra Jain	Development of Intramolecular Fleures-cent Inhibitors of the Enzyme Carbonic Anhydrase
Prof. Thomas McMahon HU/Applied Mechanics	Roger Hajjar	Negative Tension Phenomena in Skeletal Muscle
Dr. Martin C. Carey Brigham & Women's Hosp./ Gastroenterology	John Frangioni	The Molecular Mechanism(s) by which Lipids are Absorbed from the Lumen of the Gastrointestinal Tract and Cross the Apical Membranes of Enterocytes
Dr. Deborah Burstein & Dr. Eric Fossel Beth Israel Hosp./Radiology	Brent Foy	Sodium NMR Spectroscopy & Imaging of the Heart
Prof. David Baltimore MIT/Whitehead/Biology	Marjorie Oettinger	Regulation of B Cell Development
Prof. Malcolm Gefter MIT/Biology	Loren Borud	Nature of the Cellular Immune Response to the Human Immunodeficiency Virus
Prof. Richard Cohen MIT/HST	Marvin Appel	System Identification of Closed-Loop Cardiovascular Regulation
Dr. John Guinan, Jr. MIT/EECS & MEEI	Michael McCue	Feedback Control of a Feedback Loop: Sensory Systems in a Middle Ear Muscle
Prof. Robert Langer MIT/CE	Samuel Wu	Bioerodible Tyrosine Based Polymers and Their Application to Controlled Released of Antigen

NCI RENEWS FUNDING FOR HYPERTHERMIA PROGRAM

HST investigators at MIT, HMS, the Dana Farber Cancer Institute, the Joint Center for Radiation Therapy, and Northeastern University have received a grant from the National Cancer Institute to continue their promising work on tumor hyperthermia-the use of heat to improve the effectiveness of cancer therapies. The interdisciplinary consortium grant will fund development of an ultrasonic system designed to generate and deliver enough heat to kill tumors with minimal damage to surrounding tissue. The grant also will enable the technique to be tested in a hospital setting alone and in combination with drugs and radiation. These two projects are interrelated via integration of the **Profilometer** quantitative measurement system with the ultrasonic heat delivery systems. The **Profilometer system** measures the distribution of temperature, blood flow, oxygen concentration, and other quantities in the tumors and surrounding tissue.

The controlled heat source, known as the **Scanned Intensity-Modulated Focused Ultrasound** (SIMFU) system, was developed by Padmakar Lele, M.D., Ph.D., Professor of Experimental Medicine, in the Department of Mechanical Engineering at MIT and in HST. Terence S. Herman, M.D., Professor of Radiation Therapy, HMS, of the Dana Farber Cancer Institute and Harvard's Joint Center for Radiation Therapy will test scanned focused ultrasound in a hospital setting. Professor Lele, Director of the MIT Hyperthermia Center, already has tested the SIMFU system on 123 patients and found it capable of delivering enough heat (43° C) to treat deep and superficial tumors as large as 1,000 cubic centimeters.

The most effective tumor thermal therapy requires a uniform distribution of temperature at all points in the malignancy. Integration of high density thermometry and multipoint feedback control will be used to optimize homogeneity of heating. The development and application of systems to quantify temperature, blood flow, oxygen and thermal properties at closely spaced locations in and around the tumor is under the direction of H. Frederick Bowman, Ph.D. of HST and Northeastern University. The work will be conducted at the Biomedical Engineering Center (BMEC) at MIT and at Northeastern University.

Dense property measurements are necessary to develop the thermal modelling capabilities required for pre-treatment therapy planning and post-treatment evaluation. Real-time measurements also allow dynamic modification of treatment parameters as needed during therapy to generate and maintain therapeutic heating. These efforts will be carried out under the direction of William H. Newman, D. Ing., a Research Associate at MIT, who will work with both Dr. Lele and Dr. Bowman.

Further basic research in rapid hyperthermia, the treatment of tumors at temperatures higher than those currently used, but for shorter durations, and cavitation studies will be carried out at the MIT Hyperthermia Center. The NCI grant provides in excess of $1 million per year for 3 years. Others who are involved in the projects include C. Norman Coleman, M.D., Professor and Chairman of the Department of Radiation Therapy, JCRT; Emil Frei, III, M.D., Director and Physician in Chief, Dana Farber Cancer Institute; Maxine S. Jochelson, M.D., Director, Division of Onco-diagnostic Radiation, DFCI, Goran K. Svensson, Associate Professor, Radiation Therapy, HMS, and Jorgen Hansen, Visiting Lecturer in Radiation Therapy, HMS. The grant has been awarded to HST via MIT, which subcontracts different aspects of the research to the other institutions involved. Professor Bowman is Program Director.

CORRECTION

In the Fall 1987 issue of **HST in Perspective,** a number of names were inadvertently left off of the HST M.D. Class of 1991 list. We regret this error; the corrected list appears below.

Albers, Mark
Bogan, Jonathan
Chaudhry, Hina
Dang, Long
Eydelman, Malvina
Field, Seth
Grund, Stephen
Hahn, William
Haqq, Christopher
Hartman, Audrey
Hung, Albert
Kosowsky, Jeffrey
Kuhn, Duncan
Lee, Lawrence
Lin, Herbert
Malek, Adel
Martinez, Camilo
Naqvi, Hasan
Paik, Leo
Rokos, Ivan
Salant, Evan
Samosky, Joseph
Shaw, Stanley
Smirnakis, Stelios
Stelling, John
Strauss, Erich
Tsai, Eugene
Wang, Ming
Wu, Samuel
Yang, Jane

Faculty News

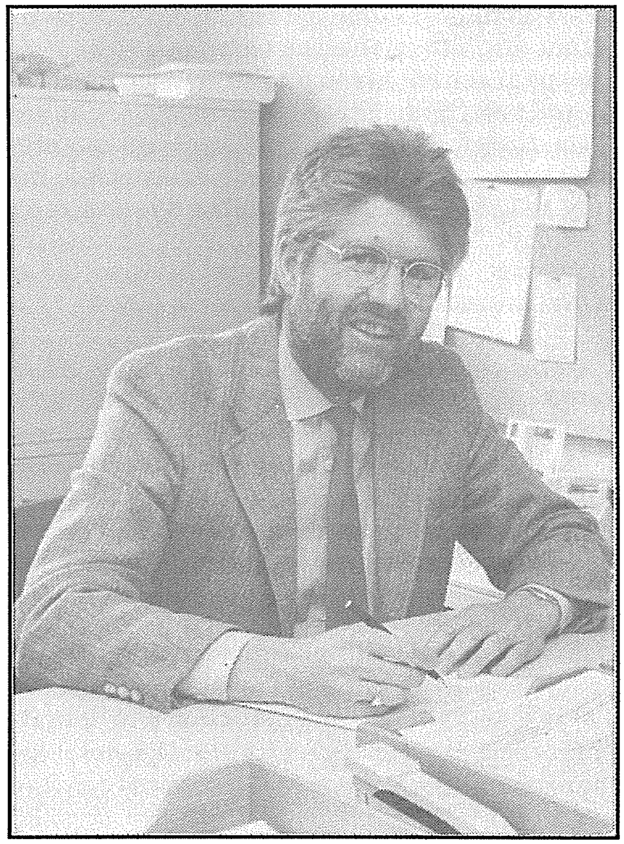
WILSON C. HAYES IS HONORED

Dr. Wilson C. Hayes, Professor of Biomechanics at HMS and in HST, has been appointed the first Maurice E. Mueller Professor of Orthopedic Surgery at Harvard Medical School. Dr. Hayes, 45, also is Director of the Orthopedic Biomechanics Laboratory at Beth Israel Hospital (BIH). The Mueller Professorship is partially supported by and named for a distinguished Swiss pioneer in orthopedic surgery. Drs. Mueller and Hayes met last February when the former was the guest of honor at a celebration in the HMS Faculty Room.

Dr. Hayes and Dr. Augustus White, Professor and Chairman of Orthopedic Surgery at BIH, established the Orthopedics Biomechanics Laboratory in 1979. "Others have studied the skeleton from the point of view of biology," Dr. Hayes comments. "We study it from the point of view of structure which we analyze with engineering techniques." Currently, he researches the causes, treatment, and prevention of fractures.

One of his efforts centers on detection of osteoporosis in the elderly using non-invasive radiographic techniques. The goal of this work is to prevent some of the 250,000 hip fractures that occur every year in the United States and so reduce the staggering $7 billion annual cost. "There may be simple ways to do this," he notes, "such as the use of padding to protect the greater trochanter (hip bone) or instruction in safer falling."

Dr. Hayes and his team have devised innovative methods for assessment of bone size and strength, and for measurement of how factors such as age, exercise, falls, and cancer affect bone. This is part of an effort to determine which people are at highest risk for fractures. "Focusing on biomechanical parameters such as bone density and geometry, and their contribution to bone strength, will enable us to improve predictions of fracture risk." One encouraging result of his research shows that patients return to a normal level of functioning much quicker than expected. Both elderly people with prosthetic hip replacements and younger victims whose hips are pinned, are back to pre- injury capacity within a year.



Dr. Hayes' work has involved him in the study of the arms of professional tennis players and the study of the Peabody Museum's collection of Pecos Indian skeletons. From the tennis players, he learned how heavy exercise can remodel bone structure.

The skeletons revealed that the increasing porosity and weakness of aging bones are partly compensated for by an increase in bone size. Geometric studies of the Pecos Indian and modern skeletons have also led him to the design of better fitting prostheses.

PROFESSOR ROBERT S. LEES JOINS HST

Robert S. Lees, M.D. joined the HST faculty on July 1, 1988 as Professor of Health Sciences and Technology. Dr. Lees, a widely recognized investigator in the field of cardiovascular disease, graduated from Harvard College in 1955 and Harvard Medical School in 1959. After clinical training at the Massachusetts General Hospital and a cardiology fellowship at the Institute of Cardiology and the National Heart Hospital in London, England, Dr. Lees worked from 1963 to 1966 in the laboratory of Dr. Donald S. Fredrickson at the National Heart Institute in Bethesda. After an assistant professorship at the Rockefeller University, Dr. Lees came to MIT in 1968 as Director of the Clinical Research Center and later of the Arteriosclerosis Center. The latter includes both research laboratories and an active cardiovascular clinic. In 1983, the clinic and laboratories moved from the MIT campus to the Harvard Medical Area: the clinic to the New England Deaconess Hospital, and the laboratories to the Shields Warren Radiation Laboratory adjacent to the Dana Farber Cancer Institute.

Dr. Lees' past achievements include the generally used classification of the hyperlipidemias; development of methods for quantitation of the plasma apolipoproteins (the fat transport proteins of the blood); a mathematical solution of the generation of sound by turbulent blood flow in arteries which led to a noninvasive method for diagnosis of carotid artery stenosis; development of methods for diagnosis of prosthetic heart valve dysfunction; and development of a method for labelling lipoproteins with ^{99}MTc for external imaging. He is a member of multiple scientific societies, including the American Heart Association, and of NIH Committees, including the Metabolism Study Section, of which he was Chairman from 1978-80.

Current projects include the development of radiopharmaceuticals for external imaging of atherosclerotic disease, testing of HMG Coenzyme A reductase inhibitors for treatment of hypercholesterolemia, the development and evaluation of external bioreactors for removing low density lipoproteins (LDL) from the plasma, and the intravascular treatment of arterial disease with the angioscope and various atherectomy devices. ❑

Student News (Cont)

CHOICE OF HST DINNER SPEAKERS
ELANA B. DOERING, Ph.D.

While I was on the Dinner Committee for my class (M.D. 1990), several of us discussed the absence of female speakers at **HST** dinners. As things turned out, neither we nor the class of 1991 invited any women to speak. In fact, since its beginning in 1974, the series has featured only three women, and fifty-eight men. The last woman spoke here nearly seven years ago.

I do not believe that the female-male imbalance reflects prejudice on the part of the student committees, or on the part of the faculty members who make suggestions. Rather, I see speakers being chosen from among well-known, established researchers and community leaders-a group that remains largely male. I suggest that we can improve the balance by extending our search for excellent speakers, and looking among junior faculty and younger community members.

HST has a tradition of seeking new talent, and the results have enhanced our reputation. **HST** appoints some young faculty members, who readily fulfill their promise. **HST** also selects some students who have been rejected by traditional M.D. programs, and these students go on to become excellent clinicians as well as scientists. In this spirit, I urge you all to contact the **HST** office if you know someone (female or male) who would be an interesting speaker. Suggestions will be forwarded to the student committee. We look forward to hearing from you!

HST STUDENTS WIN FELLOWSHIPS

It has been a good year for **Lloyd Hey**. The **HST** student graduated from Harvard Medical School and won a Paul Dudley White travelling fellowship for the summer. He plans to study health care delivery in a mission hospital in Zambia. Named for the famous Harvard cardiologist, the awards were established to encourage research and clinical experience in foreign nations.

Lisa E. Freed also received the M.D. degree in June. She is currently completing her Ph.D. entitled "An Enzymatic Fluidized- Bed Bioreactor for Blood Deheparinization: Development and Testing in Lambs on Extracorporeal Circulation." She has received a Fulbright grant and a Sheldon travelling fellowship to go to Yugoslavia, where she will spend next year working with Prof. Gordana Vunjak at Belgrade University. Lisa hopes to continue to design bioreactors, as well as to learn about a new place, after a 10 year stint at MIT and HMS.

Diamandis (Cont. from Page 1)

Diamandis, now working on an M.D. degree and a Ph.D. in aeronautics and astronautics, also is one of three founders of ISU. The university has the lofty goal of becoming a worldwide center for training tomorrow's space professionals. Its international faculty, drawn from academia, government and industry, teaches a curriculum that covers space science, engineering, medicine, law, and business.

Diamandis graduated from MIT with a Bachelor's of Science in molecular biology in 1983 and a Master's of Science in aeronautical engineering in 1987. He founded the Students for the Exploration and Development of Space, the world's largest college and high school space organization. He also originated and headed SPACEFAIR, a week long international conference, based on the MIT and Harvard campuses in 1983, 1985, and 1987. In 1983, he received the MIT Biology Department award for excellence in research, and in 1987 the Space Foundation's Space Industrialization Fellowship. His doctoral thesis describes a method to prevent the medical side-effects of long-term weightlessness, and it has led to a recently patented invention called the "Artificial Gravity Sleeper."

Do his plans include journeys into space? "I definitely plan to make part of my career spacebound," Diamandis answers. "At ISU, we are working on the design of an international base on the moon. I would like to work there or be part of a mission to Mars."

HST ELECTRONIC MAIL SERVICE

Students, faculty, and staff now have access to HST's own electronic mail system. **HSTmail** is available by logging-in through any computer in the HST society area at the Medical School. At MIT, log-in via the machines in E25-131 or at the BMEC in 20A-111. Those with personal computers and modems can enter the system by dialing 258-7871. Everyone has been assigned a system ID. If you don't know your ID, or haven't received instructions on the use of **HSTmail**, call Les Comeau (253-2862).

This system permits worldwide communication. (One faculty member uses it regularly to contact colleagues at a university in Israel.) However, the facility will be used more frequently to communicate student information. First year students have been told that they must check the system for notices. Eventually, the remaining classes will receive messages via **HSTmail** instead of U.S. mail.

HSTmail connects to the HPDESK system that services the other societies at HMS. Therefore, information can be sent and received between the two systems.

Electronic mail is a practical way to communicate with people who are difficult to reach by telephone. It saves time and frustration, but its success depends on regular use. Make it a habit to use **HSTmail**, and you will be pleasantly surprised at the result.

REARRANGEMENT OF HST-M.D. COURSES

During the 1988 academic year, the Harvard Medical School Curriculum Committee proposed major changes in the Harvard Medical School course offerings and schedules to accommodate the requirements of the New Pathways. These changes necessitated a rearrangement of the HST curriculum and the development of new HST courses in genetics and molecular biology and in pharmacology. In addition, the material previously covered in HST-050, Quantitative Physiology, has been incorporated into HST-090, 100, and 110. The HST-M.D. course schedule effective September 1988 follows.

SEMESTER 1

HST-010	Human Functional Anatomy
HST-030	Human Pathology
HST-175	Cellular and Molecular Immunology
Elective	(e.g. HST-141; Biochemistry 7.05)
JANUARY	
HST-180	Genetics & Molecular Medicine (New Course)
Electives	(e.g. HST-190, HST-900)

SEMESTER 2

HST-090	Cardiovascular Pathophysiology*
HST–100	Respiratory Pathophysiology* (2/3 Semester)
HST-110	Renal Pathophysiology* (2/3 Semester)
HST-150	Principles of Pharmacology (New Course)

SEMESTER 3

HST-130J	The Human Nervous System: The Neurosciences
HST-040	Mechanisms of Microbial Pathogenesis
HST-080	Hematology (1st 1/2)
HST-120	Gastroenterology (2nd 1/2)
Elective	(e.g HST-141; HST-220, Introduc tion to the Role of the Modern Physician [New Course])
JANUARY	
HST-020	Bone and Connective Tissue
Electives	(e.g. HST-190, HST-900)

SEMESTER 4

HST-060	Endocrinology (1st 1/2)
HST-070	Human Reproductive Biology (2nd 1/2)
HST-200	ICM
HST-131	Pathophysiology of the Nervous System

* THESE COURSES WILL INCORPORATE MATERIAL FROM HST-050, NOW DISCONTINUED. SBQS REQUIREMENTS MUST BE MET IN ADDITION

CALENDAR OF EVENTS/DEADLINES

September 6, 1988	RA applications DUE in E25-518 for fall term
	HST/M.D.-Registration, 2nd year class at HMS
	HST/M.D.-Orientation, 1st year class at HMS
	HMS Societies Dinner (1st year class only)
September 7, 1988	HST classes begin
	HST/M.D. 1st year orientation luncheon HMS
September 8, 1988	MEMP orientation luncheon at MIT
September 12, 1988	MIT registration day
September 13, 1988	MIT classes begin
October 14, 1988	MIT ADD DATE-last day to add subjects
October 28, 1988	HST FORUM-HST classes cancelled
November 14, 1988	TA applications DUE for spring term
November 17, 1988	HST Dinner Seminar-MIT President Paul Gray will speak
November 23, 1988	MIT DROP DATE-last day to drop subjects
December 23, 1988	MIT registration material for 2nd semester DUE (both for M.D. and MEMP)
January 4, 1989	HST January classes begin
January 13, 1989	RA applications DUE for spring term
January 31, 1989	HST January classes end

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HST in perspective

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