HST in perspective

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

Summer 1989

HST CO-FOUNDER EBERT ADDRESSES GRADUATES

The featured speaker at the HST Graduation Ceremony, held at the MIT Faculty Club on June 7, was HST co-founder Robert Ebert, M.D., President of the Millbank Foundation and Dean Emeritus of the Harvard Medical School. Excerpts follow.

Having had something to do with the start of the HST program, it is gratifying to find it still vigorous and still attractive to some of the very brightest people at MIT and Harvard Medical School - both students and faculty. It was started during an expansionist time when MIT had been invited by Jim Shannon, then director of NIH, to start a medical school, and I was being urged by Dave Rutstein and others to develop a program in bioengineering. Fortunately, President Wiesner and I saw the value of collaboration and the futility of competition, so the HST program was born. In retrospect, it was one of the best decisions the two schools could have made, because it harnessed particular strengths of the two universities in a way that made the whole greater than the sum of the parts. There is always luck involved, and the greatest piece of luck we had was to attract Irving London to head the program, first as a visitor and then as the permanent director.

...commencement is a happy time, because one phase of your education is drawing to a close, but it is also a time of anxiety about the future. The next year looms larger... ...but you also must think about the decades ahead and you must wonder what the medical profession will be like 10-20 years from now. ...I decided to talk about change and why I remain optimistic...

You are entering the medical profession at a time when many physicians suffer from a general malaise engendered by profound pessimism about the future of medicine.. What are the reasons for this disaffection? Are things really as bad as some say they are? Are we really in a time of crisis?

What are the symptoms of this malaise?

- It is common to hear a physician say that if he had to do it over again he would not enter medicine, and that he would discourage his son or daughter from entering medical school. I use the masculine pronoun deliberately because it is a more common complaint among men than women physicians.
- There has been a significant fall in the number of applicants to medical school...

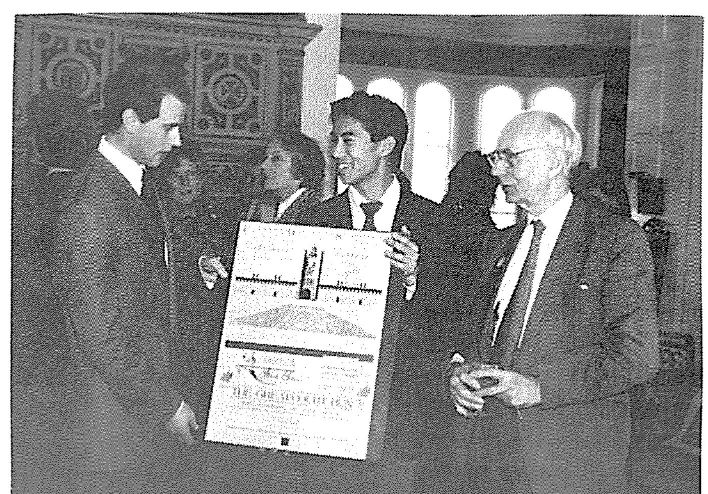
(Continued on P. 11)

Honors and Awards

HST STUDENT HONORED BY NOBEL LAUREATE AND BRITISH ROYAL FAMILY

Vincent Li (HST I) traveled to the United Kingdom recently upon invitation by physiologist and Nobel laureate Sir Andrew Huxley, O.M., F.R.S., to present H.R.H. Prince Edward with a commemorative poster which Mr. Li designed while he was the Charles Henry Fiske III Scholar at Trinity College, Cambridge University. Mr. Li was commissioned to design the graphic, which was also used for widespread publicity for a reenactment of the Chariots of Fire Race to benefit the Great Ormond St. Children's Hospital. Following the presentation, Mr. Li was a guest of honor at the event, which hosted Olympic athletes Sebastian Coe and Steve Cram and noted theoretical physicist Stephen W. Hawking.

(Continued on P. 10)



H.R.H. Prince Edward; Vince Li, and Sir Andrew Huxley

THREE NEW COURSES HIGHLIGHT HST SPRING TERM

HST-150, Principles of Pharmacology is offered for the first time in the Spring of 1989. Dr. Richard J. Cohen is the course director. The objective of this course is to teach students an approach to the study of pharmacologic agents by way of focussing on the basic principles of biophysics, biochemistry, and physiology related to the mechanisms of drug action, biodistribution and metabolism. Topics to be covered include mechanisms of drug action, dose-response relations, pharmacokinetics, drug delivery systems, drug metabolism, toxicity of pharmacological agents, drug interactions and substance abuse. Selected agents and classes of agents are examined in detail. The format of the course consists of lectures and student-led case discussions.

HST-572, Emerging Medical Technologies is a seminar course offered for the first time in the Spring of 1989. The course directors are Drs. James C. Weaver, Ronald S. Newbower, and Mr. James Tannanbaum. The objective of this course is to help future physicians develop an understanding of the limitations of current technology in medical practice and the implications of current basic research to future medical technology. The course focuses on such topics as: artificial organs, living tissue equivalents, imaging, and minimally invasive surgery.

HST-569, Photomedicine, was given for the first time in the Spring of 1989. This course is designed to provide a fundamental understanding of the interaction of ultraviolet, visible, and infrared radiation with tissue and the therapeutic uses of this interaction with particular emphasis on the applications of lasers. Basic concepts in electromagnetic radiation, its interaction with molecules, and the subsequent chemical, biological, and physical responses are presented. Specific examples from three broad areas of photobiology -- ultraviolet radiation effects, photosensitization, and laser photomedicine -- are studied in depth.

HST SECOND YEAR SHOW SLAYS 'EM IN AISLES

"Once in a great while in the course of history, a startling new creative force blazes into a stellar resplendence like a nova on the horizon of human destiny. Such was the contribution of the HST students to this year's 2nd Year Show, a two day multimedia theatrical-comedic extravaganza.
- 3 Thumbs Up!"
Siskel, Ebert, & Samosky

These renowned critics are referring to the off-Longwood production of "Can We Fake A Better Doctor?", the spectacular musical which played to sellout crowds this February. Myriad HST students from the "nominal" Class of 1991 combined their extraordinary talents with those of other 2nd year medical students to write, direct, photograph, produce, arrange, conduct, sing, video, perform, dance, and, of course, laud this take-off from the NOVA documentary.

Gentle, foot-in-mouth... er, tongue-in-cheek ribbing was directed to faculty, administration, and students alike. On the new student grading policy: "Students will be graded at the conclusion of each class period and will be assigned a class rank every hour on the hour." On the diversity of HST students: "All entering (HST) students are male Asian biochemistry majors from Harvard who play the violin and who are terribly myopic."

The highlight of the show, in this reporter's unbiased opinion, was the HST-produced video, "HMS - A Bird's Eye View". As a direct result of publishing this scholarly video, accomplished researchers at major metropolitan areas have been seen waving at pigeons in an attempt to reproduce Prof. Budgy Algernon Pober's landmark discovery that bilateral arm sweeps induce pigeon flight. (*Editor's Note: Since leaving the field of avian flight dynamics, Prof. Pober made significant contributions to the fields of fission over Boston, as well as fusion in a test tube*).

The gala event was greeted with respect, admiration, and enjoyment by the entire HMS, MIT, and medical communities. W. Hallowell Churchill was noted to have worn a bow tie specifically for the occasion, while Farish A. Jenkins trimmed his moustache and Abul Abbas cancelled a squash game in order to attend. Those deprived individuals who were unable to experience the live performances because of various forms of insidious 2nd Year Disease may still glimpse its grandeur by viewing the complete two-volume video cassette at (where else?) the Countway Hideaway... Ole!

Writer: Audrey Hartman
Photographs: Duncan "Frank Pus" Kuhn

SECOND

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Herb Lin (as R.J. Reynolds Professor of Pathology, Harvey Goldman), Jonathan Bogan (as moderator Richard Ditz), and Mark Albers (as George Michael Professor of Hip Movement, Farish Jenkins) engage in a spirited debate concerning New Pathway anatomy

1989

Iron Lung members Ivan "Rocker" Rokos, Chris "W. Axl Roseola" Haqq, Fauzi "Jon Bon Jaundice" Naqvi, and Eugene "Braunwald" Tsai are joined backstage by backup vocalist Hinna Chaudry and groupie Bonnie Ross

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HST-M.D. THESES -- CLASS OF 1989

STUDENT	THESIS TOPIC	THESIS SUPERVISOR
Aronow, Michael	"Characterization of a Rat Osteoblast-Like Culture System"	Dr. Jane B. Lian, CHMC
Baer, Margaret	"Molecular Analysis of Specific mRNA-Protein Interaction"	Dr. Lee Gehrke, MIT
Bernstein, Howard	"Extracorporeal Enzymatic Heparin Removal: Use in a Sheep Dialysis Model"	Dr. Robert Langer, MIT
Bienenstock, Kauvar Arielle	"Role of Langerhans Cells in T Cell Activation: Effect of Ultraviolet B Irradiation"	Dr. Jeanette Thorbecke, NYU Medical School
Chang, Chin-Yen	"The Development of a System to Measure Electrode Impedances and the Electrical Characteristics of Neural Tissue Surrounding a Chronically Implanted Neural Signal Transducer"	Dr. David J. Edell, MIT
Iwamoto, Satori	Part I. "Characterizing a Region of Differential Splicing in the Duchenne Muscular Dystrophy Gene" Part II. "A Method for Producing Radiolabeled Probes Via Polymerase Chain Reaction Amplification"	Prof. Louis M. Kunkel, Genetics, CHMC
Janicek, Michael	"Defects in the Progression of the Lytic Cycle of a Herpes Simplex Virus Type I Mutant Lacking Both Copies of the Immediate-Early Gene for ICPO"	Dr. David Knipe, HMS
Kujovich, Jody	"Mechanism of Calcification of Bioprosthetic Heart Valves" Role of Phospholipids in the Initiation of the Process"	Dr. Frederick Schoen, BWH
Lara, Maria Elena	"Assessment of Lung Sounds Measurement Techniques"	Dr. Daniel Shannon, MGH
Liccini, Paul	"Cyclic AMP-Dependent Regulation of Glycerol Phosphate Dehydrogenase Expression in Neonatal Rat Oligodendrocyte"	Dr. Jean De Vellis, UCLA
Renshaw, Andrew	"Development of *in vivo* Testing and Applications of a Particulate Composite Bone Cement"	Dr. Wilson Hayes, BIH
Shafman, Timothy	"The Effects of Tiazofurin on the Induction of Mouse Erythroleukemia Cell Differentiation"	Dr. Donald W. Kufe
Sorensen, Gregory	"Biochemical Correlation of the Magnetic Resonance Appearance of Cerebral Hemorrhage in the Rat"	Dr. Bruce Rosen, MGH
Tannanbaum, James	"The Graphical Display of Laboratory Information"	Dr. Howard Bleich, BIH

INTERNSHIPS -- HST CLASS OF 1989

NAME	HOSPITAL, LOCATION	FIELD OF INTERNSHIP / SUBSEQUENT RESIDENCY
Aronow, Michael	University of Massachusetts, Worcester, MA	Preliminary Surgery/Orthopaedics
Baer, Margaret	Massachusetts General Hospital, Boston, MA	Internal Medicine/Internal Medicine
Bienenstock, Arielle	New York Hospital, New York, NY	Preliminary Medicine
Bishai, William	Brigham and Women's Hospital, Boston	Internal Medicine/Internal Medicine
Chang, Chin-Yen	University of California, San Francisco, CA	Preliminary Surgery/ENT
Chueh, Henry	Massachusetts General Hospital	Primary Care
Forman, Stuart	Beth Israel Hospital, Boston Massachusetts General Hospital	Preliminary Medicine/Anaesthesia
Iwamoto, Satori	Cambridge Hospital, Cambridge, MA	Preliminary Medicine/Psychiatry
Janicek, Michael	Johns Hopkins Hospital, Baltimore, MD	OB/GYN
Klickstein, Lloyd	Brigham and Women's Hospital	Internal Medicine/Internal Medicine
Kujovich, Jody	U. of Pennsylvania Hospital, Philadelphia, PA	Internal Medicine/Internal Medicine
Liccini, Paul	Massachusetts General Hospital	Internal Medicine/Internal Medicine
Renshaw, Andrew	Brigham and Women's Hospital	Preliminary Medicine/Pathology
	Massachusetts General Hospital	Pediatrics
Selden, Richard	Brigham and Women's Hospital	Preliminary Medicine
Shafman, Timothy	Brigham and Women's Hospital Harvard Program Joint Center for Radiation Therapy, Boston	Preliminary Medicine Radiation/Oncology
Sorensen, Gregory	New England Deaconess Hospital, Boston Massachusetts General Hospital	Preliminary Medicine Radiology
Starr, Philip	Brigham and Women's Hospital Children's Hospital, Boston	Preliminary Surgery Neurosurgery
Stein, Lincoln	Brigham and Women's Hospital	Pathology

HST MEMP DOCTORAL THESES - 1989 GRADUATES

NAME	THESIS TITLE / SUPERVISOR	GRADUATION DATA / DESTINATION
Chernoff, Daniel	Kinetic Analysis of Local Anesthetic Binding To Sodium Channels: Role of pKa Gary Strichartz, M.D., Brigham and Women's Hospital	Graduated Sept. 1988 Fourth year M.D. candidate, HMS/HST
Lotz, Jeffrey	Hip Fracture Risk Prediction by X-Ray Confirmed Tomography Wilson C. Hayes, Ph.D., HMS	Graduated Sept. 1988 Senior Engineer, Failure Analysis Assoc., Palo Alto, CA
Powell, Kevin	A Flow-Based Screening System for Secretory Cells Using Gel Microdroplets James C. Weaver, Ph.D., MIT	Graduated June 1989 M.D. candidate, Tufts Medical School
Prince, Martin, M.D.	Selective Laser Ablation of Diseased Tissue: A Safe Method of Opening Occluded Arteries John Parrish, M.D., MGH	Graduated July 1988 Research Fellow, Dept. of Dermatology, Clinical Research Fellow, Department of Radiology, MGH
Sung, Cynthia	A Study of Polyethylene Oxide-Polysiloxane Networks as Bio-materials for Drug Release Edward W. Merrill, Ph.D.	Graduated Feb. 1989 Staff Fellow, Biomedical Engineering Department, National Institutes of Health
Toner, Mehmet	Kinetics of Intracellular Ice Formation in Unfertilized and Fertilized Mouse Ova Ernest G. Cravalho, Ph.D., HST	Graduated June 1989 Research Associate, Biomedical Engineering, MGH
Walsh, Joseph	Laser Debridement of Eschar: An Engineering Assessment John Parrish, M.D., MGH	Graduated Sept. 1988 Asst. Prof., Biomedical Engineering, Northwestern U.
Wodicka, George	Acoustic Transmissions in the Respiratory System Daniel C. Shannon, M.D., MGH	Graduated June 1989 Asst. Prof., Dept. of Electrical Engineering, Purdue University

THE WELLMAN LABORATORY AND PHOTOMEDICINE RESEARCH

Ultraviolet, visible and near infrared radiation are used for diagnosis and treatment of diseases. This field is called photomedicine. Early observations indicated that sunlight was therapeutic for rickets, psoriasis, tuberculosis, and neonatal jaundice. Photomedicine is now expanding into many clinical specialties. Psoriasis and T-cell lymphomas are being treated with UV radiation and a photoactive drug (PUVA therapy). Lasers are being used or developed for a large number of diseases including atherosclerotic plaque, certain cancers, kidney stones, pigmented lesions in the skin, and many ocular problems.

The researchers in the Wellman Laboratories at Massachusetts General Hospital (MGH) study the fundamental interactions of non-ionizing radiation with tissue in order to develop new therapeutics and diagnostics. This lab is the birthplace of PUVA therapy, pulsed dye lasers for portwine-stain treatment, laser removal of biliary stones, and numerous other fundamental and applied contributions. A multidisciplinary approach is standard here because the faculty spans the fields of photobiology, photochemistry, tissue optics, laser technology, experimental pathology, immunology, biophysics, and multiple medical specialties. The director of the Laboratory is John A. Parrish, M.D., who also chairs the Department of Dermatology at Harvard Medical School. The lab consists of approximately 70 people divided into eight separate but collaborating research groups.

A variety of student research projects are available with the researchers in the Wellman Laboratories. The therapeutic and diagnostic uses of photochemical, photothermal, and photomechanical mechanisms are investigated.

The effects of UV radiation and of photosensitizing treatments on normal skin are being examined by Dr. R. William Gange's group. Their current studies focus on mechanisms by which skin protects itself from UV radiation, psoralen photochemotherapy for psoriasis, and on mechanisms for photoaging, an effect of chronic UV exposure.

UV radiation also alters immunologic reactions. The mechanisms for these specific alterations and possible therapeutic applications are being investigated by Dr. Richard Granstein. Current studies involve the mechanisms for UV-induced cytokine release, cellular immunology, and investigations of immunology in the eye.

The fundamental photochemical and photobiological reactions that are responsible for UV-induced cutaneous effects and for laser-induced biological effects are studied by Dr. Irene Kochevar's group. They are currently studying laser-induced photochemistry of drugs and DNA, and mechanisms for UV damage to cell membranes and for cutaneous photoaging.

Dr. Tayyaba Hasan's group focuses on the development of methods to specifically target cells for selective phototoxicity and potential photochemotherapy. This group studies the mechanisms of photosensitizers that specifically accumulate in the target cells and have also conjugated photosensitizers to monoclonal antibodies against target cells.

The pathological changes following light-tissue interactions are studied using light and electron microscopy by Dr. Thomas Flotte's group. They are currently studying the propagation of light, acoustic, and thermal energy in tissue, and mechanisms for laser-induced and photochemically induced injury in tissue.

Fundamental aspects and clinical applications of lasers in medicine are being investigated by four groups headed by Drs. Rox Anderson, Reginald Birngruber, Thomas Deutsch, and Norman Nishioka. Some of the more basic projects include application of picosecond transient spectroscopy to study tissue ablation and high-intensity photochemistry, investigations of tissue effects from the non-linear processes (optical breakdown, plasma formation, shock-wave generation, cavitation) that result from use of picosecond and femtosecond laser pulses, and studies of cellular stress proteins and survival after thermal and photochemical injury. A new medical laser applications laboratory housing fifteen investigators was established recently to solve clinically important surgical, medical, and diagnostic problems. This laboratory combines basic, preclinical, and clinical studies and collaborates extensively with clinical departments, MIT laboratories, and industry. Current applications projects include selective laser thermal damage to pigmented cells, diverse cardiovascular applications, burn therapy, gallstone photodisruption, and multispectral image analysis and autofluorescence as diagnostic tools.

A course on Photomedicine (HST-569) is taught in the spring (*Ed. note: See P. 2*). Further information about research in the Wellman Laboratories and contact with specific groups is available by calling 726-3995.

Irene E. Kochevar, Ph.D.
Assistant Professor, Harvard Medical School
HST

HST STUDENTS AND THESIS RESEARCH AT THE MGH TERMED "IMPORTANT CONTRIBUTIONS"

In an economy move, the Department of Biomedical Engineering was reorganized this Spring. In its new structure, the department has become more tightly coupled to the faculty and students of HST. It will concentrate more heavily upon research and education and less on the clinical service function that it had provided in the past. However, the department will continue to serve as an important link between students and faculties of MIT, HMS, and HST, and the clinical environment of the MGH.

One manifestation of this role is the increasing number of theses written by undergraduate and graduate students in the department. This past academic year the following theses were supervised by faculty and staff affiliated with the department.

Acoustic Transmission in the Respiratory System, by **George R. Wodicka**, for the Ph.D. degree in Medical Engineering, HST.

This research, supervised by Daniel C. Shannon, M.D., HMS, and Kenneth N. Stevens, Ph.D., MIT, was focused on the development of theoretical models of the behavior of acoustical signals transmitted from within the respiratory tract to the chest walls. These models, confirmed by experimental measurements, should be useful in aiding clinicians in the diagnosis of respiratory pathologies by means of acoustical techniques.

After a long association with the department, George will take up a position as Assistant Professor of Electrical Engineering at Purdue University. George has contributed in many ways, both professionally and personally, to the department, for which we are most grateful. We will miss him, but we wish him well in his new adventure in academe. His work in this department has been an outstanding example of the way in which engineers can contribute to the solution of important problems in medicine.

Mechanical Design of a Hydraulically Steerable Catheter, by **Paul Cheney**, for the S.M. degree in Mechanical Engineering, MIT.

This research, supervised by Ernest G. Cravalho, Ph.D., MIT, resulted in the development of a hydraulic means of steering a catheter through the urinary tract for the delivery of laser energy during laser lithotripsy. Paul developed a unique style of design which he applied to this project with success. The performance of his design was confirmed by experimental tests of a hand-crafted prototype.

Upon completion of this work, Paul will move into a position as Product Design Engineer for Mini-Med Corporation, a company that manufactures high tech products for patient care.

Effect of Respiratory Frequency on Regional Lung Expansion and Regional Gas Transport in Healthy Dogs, by **Brion Fox**, for the S.M. degree in Nuclear Engineering, MIT.

Brion's work, supervised by Jose Venegas, Ph.D., HMS, employed ^{13}NN and the MGH Positron Camera to quantify regional gas transport in the canine lung model during high frequency mechanical ventilation. Results of these studies showed the dependency of ventilation efficiency on the frequency of ventilation. Data also showed the distribution of gas transport throughout the lung during all phases of respiration.

The Design and Development of a Clinical Instrument for the Measurement of Flow During Micturition, by **Jennie Kwo**, for the S.M. degree in Mechanical Engineering, MIT.

This work, which was supervised by Jose Venegas and Ernest Cravalho, made use of existing ultrasound technology for the development of a time of flight flowmeter that could be fitted to a patient during urological evaluation. This design proved to be superior to all existing technology in the measurement of flowrate during micturition. It is now being used routinely in the clinical evaluation of patients with benign prostatic hypertrophy.

A Skin Reflectance Spectrophotometer, by **Kris A. Sheahan**, for the S.B. degree in Electrical Engineering, MIT.

Kris's work, which was supervised by Martha Gray, Ph.D., MIT, and Alan Shapiro, M.S., MGH, was an extension of work begun by Salma Saeed during her UROP Project. Kris refined the optical design of the spectrophotometer that forms the heart of the instrument developed by the Design and Development Group, MGH-DBE, for the non-invasive quantitative assessment of bilirubin in neonates.

A Magnetometer Headpiece Designed to Measure Anterior Fontanelle Fluctuations in

Premature Newborns during Mechanical Ventilation, by **Teresa Lowenstein**, for the S.B. degree in Mechanical Engineering, MIT.

Teri's work, which was supervised by Jose G. Venegas, Ph.D., HMS, was devoted to the design of a magnetometer for the measurement of cranial deflections resulting from the positive pressures used in mechanical ventilation of neonates. Induced voltages in magnetometer coils placed on the skull were correlated with relative displacement of the coils. Experimental measurements confirmed theoretical predictions.

Use of an Infrared Temperature Sensor for the Monitoring of Surface Temperature in an Incubator, by **Salma Saeed**, for the S.B. degree in Mechanical Engineering, MIT.

This project, which was supervised by Alan Shapiro, M.S., MGH, and Ernest Cravalho, was conducted in collaboration with Exergen Corporation, a local manufacturer of infrared instrumentation. The research investigated the use of infrared sensor technology for the measurement of patient skin temperature for the control of the thermal environment of an incubator. Results of these studies identified several problems with this technology and ways in which these problems could be overcome.

Salma, who had been with the department for nearly three years, beginning with a UROP Project, won a NSF Fellowship for graduate study. Prior to commencing her graduate program, she will be employed as a Project Engineer at Hughes Aircraft.

Design of a Circular Continuous Passive Motion Machine, by **Mathew Shafe**, for the S.B. degree in Mechanical Engineering, MIT.

This research, supervised by Professor Cravalho, John F. Burke, M.D., HMS, and Luis Melendez, B.S., MGH, resulted in the design of a continuous passive motion machine for the rehabilitation of burn patients. Given the serious design constraints of the Bacteria Controlled Nursing Units of the MGH Burn Unit, the execution of the design required some truly creative solutions by Matt. In the course of his work, Matt made extensive use of the CAD (Computer Aided Design) capabilities of the DBE.

Matt is planning to continue his studies as a graduate student in Mechanical Engineering in January, 1990, after a brief hiatus as a design engineer with a neurosurgical team in California.

The Cardiac Mapping Belt for Wolff Parkinson White Syndrome, by **Xavier Sarabia**, for the S.B. degree in Mechanical Engineering.

Xavier's work, which was supervised by Prof. Cravalho and Luis Melendez, B.S., MGH, derived from a design project led by Dennis Gurgul, B.A., MGH. The design was formulated in response to a request by Jeremy Ruskin, M.D., HMS, for a means of mapping the electrical activity of the heart during surgery to correct WPW Syndrome. Xavier's work concentrated on the design of a mechanical means to affix the mapping belt to the heart for data collection during surgery.

Following completion of this work, Xavier will be joining Becton-Dickinson as a sales engineer.

All of the students who have worked with us this year have made important contributions to the development of new technologies for patient care. They have also contributed in positive ways to the professional life style of all the employees of the department. The staff of the department are grateful for these many contributions, and we wish all our students continued success in their future endeavors.

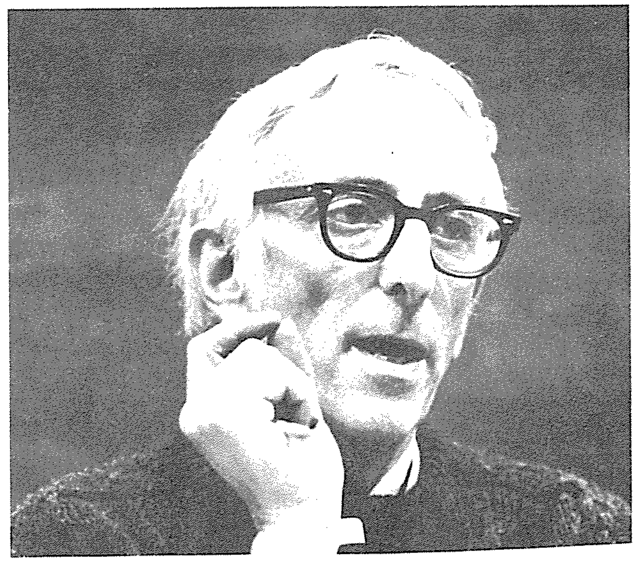
HST SPONSORS LECTURE SERIES

The HST Division was proud to sponsor a lecture series this Spring Term which presented some of the biomedical research being pursued at HST and other departments at MIT and HMS. The series was organized by Marcelo Fogaca, a senior at MIT and research assistant in Prof. Richard Cohen's laboratory. Lectures were held on Wednesday afternoons in the Whitaker College building at MIT. The following were the invited speakers and the titles of their talks: Roger Mark, M.D., Ph.D. (HST), "Real-Time Arrhythmia Analysis"; Ernest Cravalho, Ph.D. (HST), "Biomedical Engineering at the Massachusetts General Hospital"; Daniel Shannon, M.D. (HMS), "Modelling of Breathing Patterns"; Susumu Tonegawa, Ph.D. (Department of Biology, MIT; 1987 Nobel laureate), "Strategies Employed by the Immune System"; Tomaso Poggio, Ph.S. (Department of Brain and Cognitive Sciences, MIT), "Biophysics of Computation"; and Richard Cohen, M.D., Ph.D. (HST), "Beat-to-beat Variability in Cardiovascular Signals: Noise or Music?".

All of the lectures in the series were well-attended; students and faculty have commented on the rich infusion of information provided. Based on the reception this spring, the decision has been made to continue the series. The lecture series will resume in the Fall Term, and continue to be held every other week alternating with HST-590. For more information, please contact Mr. Fogaca at 253-5419.

Honors and Awards

DR. HARVEY GOLDMAN COMMENDED



The HST-M.D. Curriculum Committee at its meeting on February 6, 1989, commended Harvey Goldman for his exemplary dedication to the Division of Health Sciences and Technology from its inception in 1971 through 1988, and his leadership throughout these years of the pivotal course in Human Pathology.

Dr. Abelmann presented Dr. Harvey Goldman with a framed etching of the likeness of Francois Joseph Vicor Broussais, 1772-1838, a Professor of General Pathology at Paris. Fittingly, Broussais held that all diseases were local and were transmitted from one organ to another by means of the gastro-intestinal mucosa.

HST STUDENTS SERVE ON ADMISSIONS COMMITTEE

Eight students served on the HST Admissions Committee this year: Alice Flaherty, Eugene Kaji, Jim Oliver, Asa Abeliovich, Camilo Martinez, Keita Ito, Hal Burstein, and Stanley Shaw. They aided faculty in screening and interviewing over 300 applications, and in selecting next year's class. During the spring and summer they will be assisted by members of the first year class in maintaining contact with those accepted and in helping them arrive at final decisions.

Daniel C. Shannon, M.D.

CORRECTION

In Elana Doering's letter concerning the choice of HST Dinner Speakers (reprinted on page 14 of the Summer 1988 issue of **HST in Perspective**), the first sentence of the second paragraph should have read: "I do not believe that the female-male imbalance *necessarily* reflects a prejudice on the part of the student committees, or on the part of the faculty members that make suggestions."

VINCE LI *(Continued from P. 1)*

Mr. Li is a 1987 graduate of Harvard University, where he received the A.B. degree *magna cum laude* in Biological Sciences and in Visual and Environmental Studies/Design. Following graduation he spent one year at Trinity College, where he studied the stylistic development of pictorial representation in the Department of History of Art. In addition, Mr. Li read courses in physiology and biochemistry. Mr. Li is an accomplished pianist, and he has preformed with the Pittsburgh Symphony Orchestra and as a solo pianist on National Public Radio. His artistic achievements include a line of greeting cards and a mural for the "International Year of the Child", which was purchased by UNICEF for inclusion in their collection; Moreover, he was a Medal Award Winner for a linoleum block print in the International Children's Art Exhibition and Competition held in Taipei, Taiwan.

Mr. Li is a principal associate in Erymine Graphics, a Boston-based creative collaboration involving several other Harvard graduates (including founder William Li, Vincent's brother) and individuals from the Rhode Island School of Design. The group undertakes diverse projects such as commercial graphics, illustration, painting, and book publishing, and has also produced brochures for tour packages in Italy and Europe. Consistent with a goal of accepting projects which are challenging and interesting, Erymine Graphics recently accepted a commission to design a corporate image for the largest manufacturer of underwear in Japan.

Mr. Li has worked with Prof. Howard Green of the Department of Cellular and Molecular Physiology, HMS, on the development of surgical transplantation techniques, and he recently co-wrote a paper dealing with grafting cultured human epidermal cells onto athymic animals. He is set to begin an HST Research Assistantship with Prof. Judah Folkman, with whom he will continue to develop his interest in surgical techniques while extending his training into the fields of angiogenesis and tissue growth factors.

EBERT *(Continued from P. 1)*

• There has been a decline in the number of doctors seeking post-doctoral research training as compared with Ph.D.'s.

• There has been some decline in the prestige of physicians as judged by public opinion polls.

Those are some of the symptoms, but what are the causes of physician disaffection? To what degree are they real and in the present, and to what extent do they represent feelings about an uncertain future?

• Perhaps the single most important cause for anxiety among physicians is the feeling that as individuals and as members of a profession they are losing their autonomy. Whether based on fact or fancy is less important than the feeling that physicians no longer control the practice of medicine the way they did in the recent past. The very size and complexity of our health care system is intimidating, and it is not surprising that the individual physician feels impotent in the face of changes that appear to be initiated by big government, big business, and big insurers. Nor does organized medicine appear to have the political clout it once had. There is fear that government will soon dictate all physician fees, and there is worry that the fee-for-service system may disappear entirely, to be replaced by some form of capitation. Perhaps there really are too many doctors, or will be in the near future, and older physicians worry that they will no longer be able to compete against younger, better trained doctors.

• So far I have talked only about how doctors feel and what they think might happen. But are there concrete concerns in the present? There are - regulations are real, and American medicine is the most regulated in the world. A plethora of paperwork is real, and the problem of dealing with a variety of payors, government, the Blues, and private insurers is real. The rise in litigation against physicians is a reality, as is the cost of malpractice insurance. And the indebtedness of the young physician starting practice is a fact of life.

What about the concerns of those who are, or wish to become, physician scientists? Again there are feelings about what exists and what might happen, and there is the hard reality of what is.

• Feelings are influenced by the anxiety expressed by people who are devoted to academic medicine. Will there be adequate funding for research, will government financially squeeze teaching hospitals so hard that they can no longer fulfill their mission? Will payors continue to pay for the cost of medical education including graduate training? Feelings are also influenced by the size and complexity of the research establishment today. How does one establish one's own independence as an investigator? If universities cut back, what are the possibilities for academic tenure? Is a research career too risky? Will congress become so preoccupied with fraud that scientific research will become over-regulated? Can the physician scientist compete with the Ph.D. scientist? These are some of the concerns about what might happen. But there is real cause for concern, as well - because of what is:

• Debt and the length of training for the person who wishes to have a career as a physician scientist are real problems.

• It is no longer possible to excel simultaneously as an investigator, a clinician, and a teacher. How does one choose?

To compound the problem, those who pay for medical care worry about costs that rise far more rapidly than the cost of living. Finally, there is the general feeling that, as a nation, we are too poor and too much in debt to do very much about our most pressing social problems...

That recitation of problems might cause one to think that medicine is in total disarray, and that no bright young woman or man would wish to enter such a profession. But it is always important to ask the question - "the medical profession had become unattractive compared to what? - to the past or to other professions or occupations?"

Was the past really so much better, or is nostalgia for a better time in the past only the product of selective forgetfulness?

Let me begin with the 1920's. The majority of physicians were general practitioners, and life was neither easy nor particularly remunerative. Treatment of infection was confined to supportive therapy, and there were few specific therapies... Specialists were equally limited by the primitive technology of the time. And it wasn't easy to enter a specialty.

Academic medicine was no easier. There were few full-time positions, and the majority of clinical teachers volunteered their services. Salaries for full time faculty were low, and the decision to become a clinical investigator required an independent income or long delay of marriage - unless one could find a wealthy wife. There was little money to support research, and what was available came from the private sector for the most part.

The 1930's, dominated by the great depression, were an even more difficult time for the practicing physicians and academics. There was little money to pay for medical care, and even less for research.

During the war years of the 1940's most young physicians served in the armed services, and their older colleagues worked long hours at home caring for the

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civilian population. Training for academic medicine was delayed and required even greater sacrifice as a consequence.

In retrospect, I suppose the late 1940's, the 1950's, and the 1960's were the best of all possible times for both practicing physicians and academic physicians, but we didn't know it at the time. Physicians who had served in the armed forces witnessed both the technological and financial advantages of specialty practice, so that there was a rush for specialty training at the end of World War II. Medical practice changed dramatically and became dominated by the medical and surgical specialties. The heady success of the Manhattan Project during World War II caused the congress to think that if we could harness nuclear power, why couldn't we conquer cancer and heart disease by a concentrated effort. All that was needed was money. So the federal support of biomedical research began in earnest in the late 1940's, and money available for research and research training increased at the rate of 15% a year till the late 1960's.

But of course there were problems. Great advances were made in medical science, but no magic bullet was found to cure cancer and heart disease. The doctor draft continued until the end of the Vietnam War, and clinical training was interrupted by military service. A fortunate few were able to work at the NIH as a substitute for military service, but not the majority. In the 1960's and early 1970's there was a growing public concern about the disappearance of the family physician and the training of too many specialists. Small town America was unable to find physicians willing to practice outside the city. In the late 1960's and 1970's NIH support plateau-ed and the congress became more concerned with the mal-distribution of physicians, both geographically and among the specialties, than with the advance of medical science.

All of which is to say that the medical profession has always faced problems and always will. It is true that we may be on the threshold of some dramatic changes in the way medicine is practiced, but we are also entering a period of even more dramatic advance in our understanding of the mechanism of disease. I prefer to look at change as a time for optimism and opportunity rather than a time for fear and retreat.

Medicine as a profession still looks good to me, and if I had to do it over again I would choose medicine; for I believe I have had a more satisfying life than most of my lawyer, business, and engineering friends. Nor do I worry that much about the future. In whatever way the practice of medicine is organized, remember one thing: the irreducible unit is the doctor and the patient, and that interchange will remain the basic building block of medical practice in whatever way it is enhanced by the power of new technology.

I am enormously optimistic about the future of medicine... For the physician-scientist there has been no other time in the history of medical science when the opportunity for discovery was greater. I need not tell this audience about the power of modern biology to provide a quantum jump in our understanding of disease. And for the practicing physician there will be a rapid translation of what is learned at the laboratory bench into practical interventions for the treatment of disease. You will be able to do far more for your patients than your predecessors would have dreamed possible.

...you have an enormously rewarding time ahead. Enjoy it. Remember one other thing: you wouldn't be here today if you didn't excel. And now you have just completed a superb educational experience. Based on those observations I haven't the slightest doubt about the success each of you will achieve in the future, whatever you decide to do. I extend to you... my heartfelt congratulations...

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