COUNCIL OF ACADEMIC SOCIETIES
SPRING MEETING

March 14-15, 1985

Sheraton Washington Hotel
Washington, D.C.

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MEETING SCHEDULE FOR THURSDAY, MARCH 14, 1985

SUPPORT FOR GRADUATE EDUCATION IN THE BIOMEDICAL/BIOBEHAVIORAL SCIENCES

10:00 a.m. - 12:00 p.m. PLENARY SESSION

Warren Room

Introductions

John A.D. Cooper, M.D.
President, AAMC

Virginia V. Weldon, M.D.
Chairman, CAS, AAMC

SUPPORT FOR GRADUATE DOCTORAL EDUCATION

Predoctoral Ph.D. Education

Robert M. Bock, Ph.D., Dean,
Graduate School, Univ. of Wisconsin
Chair, Basic Biomedical Sciences Panel
IOM Committee on Research Personnel

Postdoctoral Ph.D. Education

Frank G. Standaert, M.D., Chair
Pharmacology, Georgetown University
Member, Basic Biomedical Sciences Panel
IOM Committee on Research Personnel

12:00 p.m. - 1:30 p.m. LUNCHEON

1:30 p.m. - 3:00 p.m. PLENARY SESSION

Warren Room SUPPORT FOR GRADUATE MEDICAL EDUCATION

Subspecialty Clinical/Research Training for M.D.s

Harold J. Fallon, M.D.
Chair, Internal Medicine, Medical College of Virginia
Chairman, Residency Review Committee, Internal Medicine

Research Training for M.D.s

Doris H. Merritt, Special Assistant to the Director for Manpower Development Activities at NIH

3:00 p.m. - 4:30 p.m. DISCUSSION GROUPS

Predoctoral Education of Ph.D.s

Postdoctoral Ph.D. Education

Subspecialty Clinical/Research Training for M.D.s

Research Training for M.D.s

4:30 p.m. - 5:30 p.m. PLENARY SESSION

Warren Room FINANCING GRADUATE MEDICAL EDUCATION

Report from the AAMC Committee on Financing Graduate Medical Education

J. Robert Buchanan, M.D.
General Director, Massachusetts General Hospital
Chairman, AAMC Committee

5:30 p.m. - 7:30 p.m. RECEPTION
Holmes Room

MINUTES
COUNCIL OF ACADEMIC SOCIETIES
ADMINISTRATIVE BOARD

January 23-24, 1985
Washington Hilton Hotel
Washington, D.C.

PRESENT:

Board Members

Virginia V. Weldon, Chairman
Philip C. Anderson
David H. Cohen
William F. Ganong
Robert L. Hill
A. Everette James, Jr.
Joseph E. Johnson, III
Douglas E. Kelly
Jack L. Kostyo
Frank G. Moody
Frank M. Yatsu

Staff

David Baime
Christine Burris
John A.D. Cooper*
Carolyn Demorest
James Erdmann
Thomas J. Kennedy*
David B. Moore
John F. Sherman
Elizabeth M. Short
Xenia Tonesk*
Kat Turner*

Guests

Richard Janeway*
Donald G. Langsley

I. FINANCING GRADUATE MEDICAL EDUCATION

The CAS Administrative Board met in joint session with the COD, COTH and OSR Administrative Boards at 5:30 p.m. on Wednesday, January 23, 1985, to hear an update on the activities of the AAMC Committee on Financing Graduate Medical Education from the committee's chairman, Dr. J. Robert Buchanan. Dr. Buchanan, who is director of Massachusetts General Hospital, began by reiterating the reasons for the committee's formation. Foremost was the concern that under the current payment system, teaching hospitals would not be able to continue to offer the same quality of graduate medical education (house staff training) and still remain price competitive with non-teaching hospitals. Dr. Buchanan also pointed out recent initiatives that would seriously alter the current funding system, including:

--the report by the Commission on the Future of the Medicare Part A Trust Fund;
--the report of the Inspector General of the Department of Health and Human Services, which recommended that Medicare fund only one year of graduate medical education; and
--Senator Durenberger's proposal to establish a state matching fund for graduate medical education.

* Present for part of the meeting

Dr. Buchanan noted that the increasing reluctance of both public and private payers to continue to include graduate medical education in their payments has moved the AAMC to explore alternative methods of funding for housestaff training.

According to Dr. Buchanan, the committee has agreed in principle on several points:

-- Funding for graduate medical education should be broadly financed.
-- Funding should be provided for graduates of LCME-accredited schools only.
-- Teaching and overhead costs should be provided for by a fixed percentage add-on.
-- The system should be closed; i.e., funding should be provided for a fixed number of years.

He noted, however, there are a number of issues that remain unresolved:

-- How many years of residency training should be funded?
-- How should such a system be set-up and governed?
-- Why should society finance graduate medical education?
-- What is the role of the VA and the military in such a system?
-- What about the geographic and specialty distributions of residents?

The last point, specialty distribution, has been the source of strong disagreement among the committee. Some members believe that it is time to redistribute manpower among the various specialties, particularly toward the primary care disciplines.

Dr. Buchanan concluded his remarks by stating that staff will draft an interim report that will attempt to delineate the open issues and available options facing the committee. Dr. Buchanan will then take this report to the individual Councils for discussion at their respective Spring meetings.

II. BUSINESS MEETING

A. ACTION ITEMS - CAS Board

1. The minutes of the September 12-13, 1984 meeting were corrected to note that Drs. Kelly and Ganong were discussion leaders for Conclusion 3 and Drs. Johnson and Moody of Conclusion 4 of the GPEP Report. The minutes were then approved as corrected.

2. Appointment of the 1985 CAS Nominating Committee

The CAS Administrative Board appointed the following individuals to the CAS Nominating Committee:
Chair: Virginia V. Weldon, M.D., Endocrine Society
Basic Scientists:
Daniel Branton, Ph.D., American Society for Cell Biology
David H. Cohen, Ph.D., Society for Neuroscience
George A. Hedge, Ph.D., American Physiological Society

FUTURE CHALLENGES FOR THE COUNCIL OF ACADEMIC SOCIETIES

During the past year the Council of Academic Societies has been discussing the major challenges facing medical school faculties in the areas of education, research, and patient care. These discussions resulted in the creation of an issues paper entitled "Future Challenges for the Council of Academic Societies," which was reviewed by the CAS Administrative Board at its June and September meetings and discussed by the entire Council at last October's Annual Meeting. Society representatives were surveyed to determine the priority to the CAS of various action items suggested within the paper. The following items were given the highest priority most often by those who responded to the survey:

(1) The CAS should continue strong advocacy for biomedical research appropriations.
(2) The CAS should continue efforts to achieve increased funding for research training.
(3) The CAS should work with departmental chairmen to increase the institutional priority for medical student education.
(4) The CAS should focus more attention on examining policies and initiatives for support of junior research faculty/new investigators.
(5) The CAS should provide a forum for discussion and development of policies to balance competing interests in an atmosphere of constrained funding.
(6) The CAS should undertake an examination of how medical student education programs are supported.
(7) The CAS and individual academic societies should involve themselves in efforts to limit restrictions on the use of animals in research.

In addition, basic scientists supported the following items:

(8) The CAS should provide a forum for the presentation and discussion of knowledge and skills that should be shared by all disciplines in the biomedical sciences.
(9) The CAS should examine how faculty involvement in planning and implementing improvements in medical education can be enhanced.

And clinicians expressed interest in these topics:

(10) The CAS should become involved in policy issues related to faculty practive efforts and their relation to the overall academic missions of faculty.
(11) The CAS should support the establishment of an AAMC-wide Task Force to discuss proposed policies and funding for graduate medical education.

During the Council's discussion of the survey it was noted that most of the top priority issues focused on challenges to the faculty in their roles as research investigators. One veteran Council member commented that this emphasis reflected the role that has evolved for the CAS in relation to the other two councils over the past 15 years. He observed that while all members of the academic community are concerned about a wide range of issues, a tradition had developed within the AAMC that the COD took the lead in issues related to medical student education, the COTH led in issues of patient care, and the CAS led in biomedical research issues.

The results of the survey were forwarded to all Council representatives for review with their individual societies prior to further formulation of an action agenda. During its January meeting, the CAS Administrative Board reviewed the status of current and proposed CAS/AAMC activities in each of the priority areas highlighted by the Council.

(1) The CAS should continue strong advocacy for biomedical research appropriations.

Both the CAS and the AAMC have been intimately involved in the efforts to unite the research community in advocacy for appropriate budget requests for research at NIH and ADAMHA through the Ad Hoc Group on Medical Research Funding. The Ad Hoc Group's strategy of agreement by the research community on a single overall budget request for the NIH and ADAMHA has received favorable response from the Appropriations Committees and has been credited with a significant contribution to the Congressionally mandated increases for biomedical research appropriations in times of fiscal austerity.

The current challenges by the White House Office of Management and Budget to the fiscal 1985 appropriations for biomedical research, coupled with the President's proposed budget for fiscal 1986, represent a serious threat to the integrity and stability of the nation's medical research enterprise. Therefore it is imperative that the Council continue to support the efforts of the Ad Hoc Group to maintain appropriate funding for medical research.

(2) The CAS should continue efforts to achieve increased funding for research training.

Within the Ad Hoc Group's "bottom line" budget requests, the CAS and the AAMC have supported proposals for the distribution of additional funding across different types of programs, including research training and research career awards, as well as the provision of funds to meet the National Academy of Science recommended number of research trainees and to expand the research career/scientist award programs. These efforts proved very successful in 1985 when a 33 percent increase in the NRSA budget was approved.

(5) The CAS should provide a forum for discussion and development of policies to balance competing interests in an atmosphere of constrained funding.

In 1983 the CAS Interim Meeting was devoted to a discussion of the relative balance of funding among various components of the NIH portfolio during an era of constrained funding. At that time attention was focused on the limitations in funding for research training and other components of the grants portfolio because of the squeeze on a fixed budget occasioned by funding 5,000 ROIs. Vigorous efforts to remedy this situation resulted in funding for NIH for this fiscal year which provided growth in all funding mechanisms including ROI grants.

(4) The CAS should focus more attention on examining policies and initiatives for support of junior research faculty/new investigators.

(11) The CAS should support the establishment of an AAMC Task Force to discuss proposed policies and funding for graduate medical education.

The CAS Spring Meeting will be devoted to a discussion of "Support for Graduate Education in the Biomedical/Biobehavioral Sciences." The meeting will deal with both pre- and post-doctoral Ph.D. training as well as clinical fellowships and research training for M.D.s. Dr. Robert Buchanan, chairman of the AAMC Committee on Funding Graduate Medical Education, will present an update on the committee's activities during the past several months.

In 1980, the AAMC published a report on Clinical Research Manpower prepared by an Ad Hoc Committee on Clinical Research Training. Since that report, a number of events have occurred, including decreased funding and increased competition for grants, which have prompted the NIH to begin serious discussion on various aspects of the extramural awards system. In January, the CAS Administrative Board reviewed the recent policy discussions of the NIH Director's Advisory Committee on research training and the extramural awards system, particularly with regard to new investigators. The Board discussed the possibility of an AAMC Task Force to examine federal policies and programs for research career development for both Ph.D.s and M.D.s.

(7) The CAS and individual academic societies should involve themselves in efforts to limit restrictions on the use of animals in research.

With regard to efforts to limit restrictions on the use of animals in research, the CAS has been actively involved in the Association's participation in an ad hoc steering committee instrumental in the merger of the NSMR and the ABR. This joining of resources within the scientific community will provide a unified program of educational and legislative activities to both academic institutions and research societies. The AAMC has also been working with the AMA and the APS to raise the level of awareness of this problem among a variety of medical and scientific organizations. In addition, the CAS has planned an exhibit of educational materials at the 1985 CAS Spring Meeting. This exhibit will inform the academic societies about the types of materials currently available for use in public education programs on animal research.

(10) The CAS should become involved in policy issues related to faculty practice efforts and their relation to the overall academic missions of faculty.

Following discussion at the January Administrative Board, it was agreed that Deans, Hospital Directors and key faculty chairmen and directors of institutional practice plans would be surveyed to identify and articulate policy concerns related to faculty practice plans. This survey represents the first stage in an Association examination of practice plans occasioned by the high priority assigned to this issue in both the CAS and COD issue papers.

(3) The CAS should work with departmental chairmen to increase the institutional priority for medical student education.
(6) The CAS should undertake an examination of how medical student education programs are supported.
(8) The CAS should provide a forum for the presentation and discussion of knowledge and skills that should be shared by all disciplines in the biomedical sciences.
(9) The CAS should examine how faculty involvement in planning and implementing improvements in medical education can be enhanced.

These four concerns of the CAS in the area of medical education will provide the focus for a discussion of the GPEP Report and plans for its implementation by a Working Group of the Administrative Board chaired by Douglas Kelly. The group will meet just prior to the Spring Meeting. The Working Group will assess which aspects of the GPEP recommendations should be implemented at an institutional level and which nationally through the AAMC. Their perspective on the report will be shared with the Administrative Board and Council and with the Council of Deans Administrative Board as an agenda for post-GPEP activities by AAMC is developed.

The CAS Administrative Board is examining further plans to continue and expand its leadership role in regard to these eleven issues which the Council deemed high priority for the CAS membership. Any suggestions from member societies would be welcome.

PINK AND BLUE MEMORANDA

THE ROLE OF CAS PUBLIC AFFAIRS REPRESENTATIVES

During our discussion of the CAS Future Challenges paper at the Annual Meeting, a number of speakers commented on "closing the loop" of communication between the CAS and member societies. The Council became aware that societies varied greatly in their ability to respond to a request for their opinions or for action made by the CAS/AAMC. It was suggested that the Council could benefit from further discussion of how CAS representatives relate to their societies and from hearings about societies which are models of good representation and communication.

Since new societies continue to be added to the CAS ranks, it is perhaps timely to review the loop for communication on urgent issues in public affairs, so that the CAS can achieve optional input in those issues of greatest concern.

The AAMC sends memos throughout the year to CAS societies reviewing urgent concerns in the area of public affairs and often seeking constituent help in responding to Congress on an issue. Such memos are:

Pink Memos - immediate action requested
Blue Memos - indepth background, action often requested

Approximately 60-70 such alerts are sent to your society each year. On issues of particular concern to CAS, a CAS Alert sheet (yellow) may accompany the memo with further details or action suggestions. All seven officers and representatives, as listed in the CAS Directory, receive each of these mailings. For instance, several pink memos have recently been sent regarding the OMB decision to restrict the FY85 NIH Budget to 5,000 new and competing renewal grants.

Questions for Discussion:

1. Are Pink and Blue Memoranda received by the proper persons in each society?

2. Does your society have a mechanism for response to such a request for action?

3. Who initiates such a response? Are the two CAS representatives responsible for communications from the CAS/AAMC? Does the Public Affairs Representative (PAR) get involved?

4. Is there a separate and unique role for the PAR? Is it useful to have this third designee in addition to the CAS representatives?

5. What can be done to improve the participation of societies in regard to those issues which they feel are germane to their missions?

CURRENT ISSUES IN FEDERAL RESEARCH POLICY

In response to continuing concern with and criticism of the current grant awarding mechanism, the NIH Director's Advisory Committee (DAC) recently conducted a day-long discussion of the NIH extramural awards system. The meeting, which was held on November 19, 1984, continued a dialogue that began on September 30-October 1 with a retreat for the Director, members of his staff, and the Institute Directors. Both meetings explored the underlying philosophy and structure of the NIH extramural award system and considered possible options to simplify the current peer review system, maintain incentives for new investigators to seek research careers, stabilize the research environment for investigators through longer award periods and increased emphasis on past productivity, and assure an equitable review for all applications including clinical research proposals.

Two central issues emerged from these meetings. Does the current two-tiered system of review by scientific peer groups and institute advisory councils function in an effective and efficient manner in selecting grant recipients? And, are the grants themselves structured to produce maximum benefit, for both the investigator's research career and the scientific enterprise as a whole.

In his opening remarks at the November DAC meeting, Dr. Wyngaarden pointed out that the fundamental principle of the NIH extramural awards system -- to distribute funds through national competition based on scientific merit and technical feasibility -- was formulated at a time when the philosophy was that such funding was an investment. Since then, the competition for funding has dramatically increased. Through the mid-1960s, the NIH budget annually increased by 24 percent in terms of purchasing power. But since 1968, the annual increase in purchasing power has been only two percent, and between 1979 and 1982, the NIH budget lost 12 percent in purchasing power. Meanwhile, the number of applications has tripled during the last decade, and the number of R01 and P01 grants has grown from 9,000 to over 18,000. Extramural research funds accounted for 65 percent of the total NIH budget in 1983, compared with 44 percent in 1972. Still, there has been a continued decrease in the payline for grant applications to the 160-180 range. In 1984, NIH was able to fund only 32 percent of all grant applications.

This increasing competitive pressure has resulted in a shift from a philosophy of investment to one of procurement, which, in turn, has produced increased demands for accountability. Grant applications require much more specification than ever before, run into hundreds of pages, and take from three to six months to prepare. The drive for accountability has also shortened the length of the awards being made; virtually all first-time awards are for three years. Shorter awards require investigators to organize and submit applications for renewal 15 to 18 months after the original award. Thus the trend is increasingly towards safe research with quick pay-offs. Young investigators are particularly pressured by such tight schedules because of the time required to establish laboratories.

Peer Review

The first part of the DAC meeting dealt with the grant review process; both the study sections and the advisory councils. While it was agreed that no alternative to peer review was desired, it also was acknowledged that significant concerns over the mechanics of the review still exist within the scientific community. Dr. Wyngaarden expressed some of the concern of the extramural community by asking whether the system was capable of distinguishing between degrees of excellence in research

proposals. Several other issues were raised, including the "behavior" of the study sections. Dr. Howard Morgan, chairman of the Department of Physiology at The Pennsylvania State University, noted that many study sections replace outgoing members with individuals from the same laboratories or with associates, thus perpetuating a limited set of views within that section. Others criticized the heavy workload of the study sections, stating that some study section members read only those applications assigned specifically to them. It was pointed out that the number and complexity of the grant applications encourages study sections to focus only on what is wrong with the applications -- a practice critics claim discourages submission of valid, but incomplete research ideas. The large number of applications also was blamed for study sections using less experienced reviewers, a charge critics claim is substantiated by "non-germane" critiques in the pinksheets summarizing the study section's review.

The institutes' advisory councils also came under criticism from members of the DAC. The purpose of the review by the councils is unclear to some observers. Critics charged that some councils are not scientifically competent to review decisions made by study sections, that they do not receive adequate staff support from the institutes, and that they only serve as "instant replay" for the peer review. The increasing politicization of appointment to institute advisory councils was also decried. It was suggested that councils might make more use of ad hoc consultants and that councils should become better equipped to perform their oversight function. However, there was no consensus within the committee of specific steps to accomplish these solutions.

Extramural Awards

The second set of issues surrounds the awards themselves, particularly the length of the awards. Concern was expressed that the current system of renewal every three years places extreme constraints on the investigators. Individuals must make a heavy investment to enter a system where only 35 percent of the applicants are funded and where the "half-life" for investigators is only seven years. There was much discussion of the wisdom of a system that loses trained investigators after such a relatively short period of time. It was also noted that the necessity of reapplying after only 15 to 18 months means that some individuals, especially new investigators, may not have an adequate time to demonstrate adequate research performance before renewal.

Discussion focused on what the desirable characteristics of the award system would be for investigators at different career stages: new, mid-career, and established investigator. There was significant sentiment toward extending the length of grant awards beyond three years. It was felt that this would benefit new investigators by providing them more time for startup and allowing them to establish evidence of independent productivity before renewal. Problems identified for mid-career investigators included hiatuses in funding when the competitive renewal score of an excellent investigator just misses the payline cutoff. Possibilities for interim funding were discussed.

Dr. Vernon Mountcastle of Johns Hopkins noted that while peer review has "the power to weed out those who do not have the capacity for sustained discovery throughout an extended career," mistakes do happen in the present system. He proposed a system where an institute could carry an investigator for up to two years, while the investigator applied for a grant. Dr. Mountcastle's system would require that the individual's institution make the decision to extend funding and a significant contribution to that funding.

Established investigators were felt to need a system which acknowledges their exceptional track records and makes awards based upon past performance more than proposed research. Members of the DAC heard from both the NCI and the NINCDS about their newly instituted programs to support established investigators at the "peak" of their careers. Dr. Vincent DeVita, director of the NCI, noted that his institute's Outstanding Investigator Awards will provide stability to proven researchers by consolidating their research support and providing it for a longer period of time. The premise of the awards is to support the investigator, not a specific project. Dr. Murray Goldstein, director of the NINCDS, described the Javits Awards program. Like the NCI award, the Javits Award is intended to provide support for seven years. Unlike the NCI award, however, the applicant cannot specifically apply for these awards. NINCDS staff examines applications for regular grants to identify those individuals whose records might warrant a seven year commitment.

The tenor of the meeting was toward the support of longer award cycles for investigators at each "life stage." It was felt that this change would increase stability, enhance creativity and research productivity, diminish unproductive stress, and reduce the aura of futility that surrounds the awards system, discouraging young people from seeking research careers.

Caution was urged by Dr. Wyngaarden, who pointed out that extending the commitment base would cost more money in the long run, which would mean fewer new grants if the current tight budget situation continues. Another criticism was heard from Dr. Mountcastle who disagreed with the concept of stability and characterized research as "a Darwinian system where peer review selects those best able to continue." He emphasized that extensive efforts to support investigators, as opposed to projects, were not warranted.

No final policy conclusions were reached at the meeting, but it is clear from both this last meeting of the DAC and its December 1983 meeting devoted to Research Training that the NIH is considering changes in research policy in areas of key interest to members of CAS. There has not been a systematic review of these aspects of biomedical science policy by CAS/AAMC in recent years. The NIH is actively seeking the advice of the science community in regard to its research and training policies.

In January, the CAS Administrative Board discussed the possibility of an AAMC ad hoc committee to review the current activity in federal research training and career development policies.

SUMMARY OF GPEP CONCLUSIONS

A) Purposes of a General Professional Education

1. Faculties should emphasize the development of skills, values, and attitudes by students and limit the amount of information that students are expected to memorize.
2. The level of knowledge and skills that students must attain to enter graduate medical education should be described more clearly.
3. The education of students must be adapted to changing demographics and the modifications occurring in the health care system.
4. Students' education should include an emphasis on the physician's responsibility to work with individual patients and communities to promote health and prevent disease.

B) Baccalaureate Education

1. The baccalaureate education of every student should encompass broad study in the natural and the social sciences and in the humanities.
2. Whenever possible, the courses required for admission should be part of the core courses that all college students take, and medical school admissions committees' practice of recommending additional courses beyond those required for admission should cease.
3. The pursuit of scholarly endeavor and the development of effective writing skills should be integral features of baccalaureate education.
4. Medical school admissions committees should use criteria that appraise students' abilities to learn independently, to acquire analytical skills, to develop the values essential for members of a caring profession, and to contribute to society and should use the Medical College Admission Test only to identify students who qualify for consideration for admission.
5. Communication between medical school and college faculties about selection criteria should be improved.

C) Acquiring Learning Skills

1. Medical faculties should adopt evaluation methods to identify: (a) those students who have the ability to learn independently and provide opportunities for their further development of this skill; and (b) those students who lack the intrinsic self-confidence to thrive in an environment requiring independent learning and challenge them to develop this ability.
2. Attainable educational objectives should be set and students provided with sufficient unscheduled time to pursue those objectives.
3. Medical faculties should examine the number of lecture hours they now schedule and consider major reductions in this passive form of learning.
4. Faculties should offer educational experiences that require students to be active learners and problem-solvers.
5. In programs emphasizing the development of independent learning and problem-solving skills, the evaluation of students' performance should be based in large measure on faculty members' subjective judgments of students' analytical skills rather than their ability to recall information.
6. Medical schools should designate an academic unit for institutional leadership in the application of information sciences and computer technology to physician education.

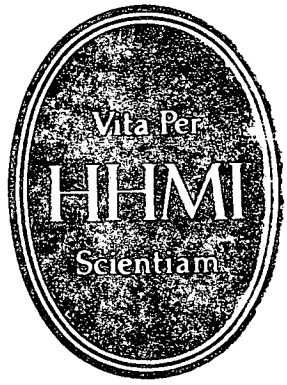
D) Clinical Education

1. Faculties should specify the clinical knowledge, skills, values, and attitudes that students should develop.
2. In conjunction with deans, department chairpersons, and teaching hospital executives, faculties should develop strategies to provide settings appropriate for required clerkships.
3. Those responsible for the clinical education of medical students should have adequate preparation and the necessary time to guide and supervise medical students during their clerkships.
4. Faculties should develop explicit criteria for the systematic evaluation of students' clinical performance and share evaluations with students to reinforce the strengths of their performance, identify any deficiencies, and plan strategies with them for needed improvement.
5. Faculties should encourage students to concentrate their elective programs on the advancement of their professional education rather than on the pursuit of a residency position.
6. Where appropriate, basic science and clinical education should be integrated to enhance the learning of key scientific principles and to promote their application to clinical problem-solving.

E) Enhancing Faculty Involvement

1. Medical school deans should designate an interdisciplinary organization of faculty members to formulate a comprehensive educational program for medical students and to select the instructional and evaluation methods to be used.
2. This educational program should have a defined budget that provides the resources needed for its conduct.
3. Faculty members should have the time and opportunity to establish a mentor relationship with individual students.
4. Medical schools should establish programs to assist members of the faculty to expand their teaching capabilities beyond their specialized fields to encompass as much of the full range of the general professional education of students as is possible.
5. Medical faculties should provide support and guidance to enhance the personal development of each medical student.
6. By their own attitudes and actions, deans and department chairpersons should elevate the status of the education of medical students to assure faculty members that their contributions to this endeavor will receive appropriate recognition.

President's Report



Two Challenges to Negative Prophecy:

"Clinical Applications Units"

and

"The Cloister Project"

TWO CHALLENGES TO NEGATIVE PROPHECY:

"Clinical Applications Units"

and

"The Cloister Project"

By
Donald S. Fredrickson, M.D.

From the President's Report to the Trustees of the Howard Hughes Medical Institute, July 21, 1984

PRESIDENT'S REPORT

THE SUMMER issue of *The American Scholar* contains a thoughtful article entitled "*The End of the Physician-Scientist?*"[1] The author, Gordon Gill, predicts that in America — as he says happened in England and on the European continent ten years ago — a schism between basic science and clinical medicine will soon be complete. The gist of his message is that the clinician-scientist is now the "clinician-applier of basic science" and is not likely to keep pace, much less surpass the basic research specialist. By Dr. Gill's reckoning, the revolution in biology has bypassed the medical profession, and the academic practitioners will have to be content with simply improving the quality of care.

The dizzying acceleration of molecular biology is thus viewed as threatening the extinction of a never-too-abundant species: those physicians who have managed to be both prime movers in solving fundamental problems in the laboratories and pioneers in applying what they learned on the hospital ward. Especially from the early 1950s to the '70s, the intramural program of the National Institutes of Health was a rich breeding ground of such hybrids, and their migrations to and fro between Bethesda and Academe transformed medical education. Today it would appear that Cal Tech and MIT and Cold Spring Harbor are the preserves of the new biology and that physicians who winter there may never return to the clinic.

There is legitimate concern here — one of profound importance to many, including the Howard Hughes Medical Institute.

The HHMI was chartered to promote "human knowledge within the field of the basic sciences (principally the field of medical research and education) and the effective application thereof for the benefit of mankind." From the outset the organization has interpreted this as a mandate to embrace the full continuum from fundamental inquiry to clinical application. This purpose has been pursued according to three principles: an unrelenting search for excellence, a determination to complement and not merely duplicate the methods of similar organizations, and a willingness to run counter to prevailing trends if long-range projections of need and opportunity appear to merit the risks. It is in this context that one should give thought to the sobering prophecy above.

All of us who work in the worlds of medicine and science understand the possibly grave consequences of a break in the connection between those worlds. If the academic physicians should no longer be able to cope with the frontiers of biology, what kinds of 'visits' are going to be leading the troops from bed to bed in the medical centers of the future? Who will be the clinical interpreters of the new technologies for cloning and sequencing, measuring genetic polymorphism, or controlling embryonic development? Who will be the advocates for the patient or the learned counsels for society?

Such questions translate into precepts for the imminent future. Science's inventions must continue to be transformed into efficient means for alleviating ill health. The awesome power of biological manipulation must be competently and wisely exercised. And humaneness must guide application.

In sum, if the lights dim that have traditionally given the students their headings as they move out into the practice of medicine, how will they cope with the scientific innovations ahead?

It would appear that the prevailing mood about this looming problem is running toward the negative. We propose at least two countermeasures.

"CLINICAL APPLICATIONS UNITS"

ALTHOUGH the quickened pace of scientific discovery does present a formidable demand upon medical scientists in general, it is a desirable reality rather than the issue here. But a real and major problem is the increasing distraction of the clinical investigator by certain features of the present system of academic science and medicine. There is incessant and ever-mounting pressure to engage in practice and contribute to faculty income, in turn needed to support the school. A second demand arises from the emphasis in federal research funding upon short-term awards for investigator-initiated projects. The selection of such projects by peer review conducted along disciplinary lines is a most admirable method and needs no defense. It can be deadly, however, to the professor of medicine who must compete within today's narrow range of priority scores against others who are not burdened by the ward rounds and clinical teaching that are vital to the clinician-scientist's role.

The answer does not lie in freeing clinicians from the wards and clinics. Nor can it be found in radical changes in the NIH processes for making awards. Block support to institutions for research by faculty is not a practical alternative, and study panels cannot and should not be persuaded to veer from their traditional orientation to the proposal rather than the proposer.

The situation is a natural opportunity and a worthy challenge to HHMI, which has resources and flexibility matched by few other organizations.

Ways have to be found to keep the bridges open between the basic and the clinical sciences. We believe one formula is the placement of HHMI laboratory units in appropriate affiliate institutions. These units would have the following attributes:

Each would be headed by a clinician-scientist capable of both directing fundamental research in the laboratory and leading clinical investigations. He or she should be highly experienced and demonstrably productive. The unit should have several basic themes, including clinical application of one of the new paradigms in science, such as exploration of basic problems in molecular genetics and movement of emerging techniques toward effective medical interventions.

In each unit would be several junior scientists ranging from 'pure' molecular biologists to investigative physicians. Some might have independent budgets, some not; but all should be amenable to benefit from interaction with the senior investigator and the rich mix of talents that such units must be prepared to maintain.

Opportunities should be provided for early postdoctoral candidates, including recent M.D.-Ph.D. graduates reentering research from subspecialty training. Predoctoral candidates of various kinds, including medical students, should also be engaged.

The funding of the group should include stable, long-range commitment for the senior investigator, for the junior but established colleagues, and for their core support. The amounts and renewals should be subject to periodic review. Some of the activities may be supported by grants from external agencies, particularly for the younger staff members on more limited appointments.

The setting of such a unit or units must be in conjunction with an academic hospital, which will usually have an NIH-supported clinical research center accessible to the HHMI unit, obviating the need for routine support of beds or clinical care. Several kinds of projects, not otherwise likely to be funded, might be undertaken:

◇ certain worthy clinical experiments of high (scientific) risk and unusual cost;

◇ studies of interventions in field or clinic, with long-range observation of effects; and

◇ tutorial exercises promoting understanding of the social and ethical aspects of molecular biology as applied in medicine — activities that should include participants with different points of view.

One to several units would be co-operative within the affiliated institution. Each might have from 4,000 to 10,000 square feet of space, and would share service facilities and personnel. The chiefs of the units would form, together with the chairmen of appropriate clinical and perhaps basic science departments, a directorate capable of assisting in recruitment and maintaining a productive milieu and effective interactions. Maximum integration of the unit into the full academic life of the affiliated institution is imperative, though limitations on the time spent in faculty administrative activities (common to all HHMI units) would be important in assuring high productivity.

Unit members, including very junior staff, should have opportunities for training and experience in remote basic or clinical settings to enhance their contribution upon returning to the parent unit.

In July 1984, agreement was reached to create an "HHMI Laboratory for Clinical Applications of Molecular Genetics" in Ann Arbor affiliated with the University of Michigan Medical School and its university hospital. The first 17,000 square feet of space will be ready for occupancy by January 1986, and additional contiguous space up to twice that amount will be available a year later. Recruitment of senior clinical investigators is under way.

"THE CLOISTER PROJECT"

FEARS OF EXTINCTION of the properly trained clinician-scientist have been fueled by several indices in the last few years. A decrease is perceived in the numbers of medical school graduates choosing full-time careers in research. There has also been a decline in the proportion of M.D.'s among those participating in NIH training programs and among principal investigators on NIH research grants. To the social and economic factors believed to underlie these trends must be added the progressive lengthening of the period of preparation for a career in biomedical science as the search for knowledge moves to the molecular level.

Paradoxically, the growth of medical knowledge is also displacing research experience from the medical curriculum. Most students now graduate without a taste of the gratifications of scientific inquiry, or an opportunity to benefit from such experience in the practice of their profession.

Research training that begins only after the years of clinical residency is often too little to produce an investigator who can compete successfully or too late to attract trained physicians from more remunerative career alternatives.

Despite anxiety about the increasing competitiveness and thus the narrowing of opportunities for a career in research, a desire for early scientific experience remains strong among many medical students today. It is a common faculty impression that the number of students interested in taking time out to gain such experience is again increasing. Fellowship programs to make this possible — the Dana Foundation Clinical Research Training Program and the American Heart Association Medical Research Fellowship Program, to mention but two — have recently materialized and are already oversubscribed.

There are some generally accepted conclusions about such opportunities for student research. The period of engagement ought to be sufficient to get a good start in techniques and perhaps to see some aspect through. Six months is barely enough; clearly a year is better. The best time to begin is probably at the end of the second year of medical school, though aptitude and opportunity will vary. A decent wage should be provided, for many students have dependents and some are already heavily in debt for their education.

Other conditions of a broader nature should be met. The experience should be conducted in an atmosphere of excellence, where scholastic discipline and the critical faculty are deeply ingrained, and where the collegiality of peers amplifies encounter with the scientific method and its practitioners. Thus should be instilled the ideal of the scholarly community.

Another major need is for continuity of experience — provision for followup that will sustain the first quantum leap in interest and excitement about research. As the graduates of the NIH Medical Scientist Program (affording M.D.-Ph.D. training) can witness, the reentry into scientific competition, after a long interruption for residency training, can be difficult. The specialty boards are at long last beginning to soften their once rigid requirements for uninterrupted clinical training. Moreover, an isolated research experience as a student cannot sustain an ambition to become a scientist. The medical schools should encourage continual exposure to the laboratory for that important minority of students bound for a research career.

The HHMI and NIH have this month concluded that it will be to their mutual advantage to foster cooperation between their intramural research operations. One feature will be a unique program to offer students an extended period of research training in NIH laboratories. This will include residence on the NIH campus and opportunities to continue the research experience upon return to school.

The focus for this program will be facilities provided on NIH grounds by renovation and construction at the Mary Woodard Lasker Center for Health Research and Education, recently acquired near the Clinical Center and other NIH facilities at Bethesda. To the venerable convent once inhabited by the

Proposed structure at the Mary Woodard Lasker Center for Health Research and Education.

cloistered Sisters of the Visitation will be added a residence for the "Hughes Research Scholars." Also to be created are new lecture halls, classrooms, commons rooms, and a teaching laboratory for use of the students and the entire NIH community.

Initially at least, the recruits will be medical students, entering usually after their second year. The class will begin in 1985 with about ten trainees and will grow to an annual total of thirty. Announcements will soon appear informing students in all of the nation's medical schools how to apply. The program will be overseen by a committee of NIH and HHMI scientists, and the students will spend their first year in NIH laboratories. HHMI scientists will cooperate in recruitment, counseling, seminars and didactic exercises, and can play an especially valuable role in helping the students maintain research activities upon return to their home institutions.

Estimated costs to HHMI for creation of facilities and operating expenses of the program during its first five years will be about $10 million. It is anticipated that the HHMI-NIH cooperation will be a long-lasting one. Surely this public-private partnership in training for research careers should prove to be an important bridge for sustaining the essential connection between basic research and clinical application.

Donald S. Fredrickson, M.D.

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[1]Gordon N. Gill, The End of the Physician-Scientist? *The American Scholar*, 53:353-368, Summer 1984.

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DEPARTMENT OF PHYSIOLOGY
SCHOOL OF MEDICINE
PHONE: 415-666-1751

SAN FRANCISCO, CALIFORNIA 94143

January 29, 1985

Dr. Elizabeth Short
AAMC
Department of Academic Affairs
One Dupont Circle, N.W., Suite 200
Washington, D.C. 20036

Dear Libby:

Following up our telephone conversation, I enclose a copy of the unsolicited letter I got from the National Medical Research Matching Program, Inc. with the attached resumes, and one sample of the type of letters that have been pouring into my office since then. As I told you, I am not sure where they got the information that we were looking for postdoctoral fellows. We are always in the market for good candidates, but have not advertised recently and as far as I know the only place our training program is listed is in the Journal of Clinical Endocrinology and Metabolism. As I also mentioned, Zena Werb at our institution received a similar mailing that I believe was unsolicited, and it may well be that others on our faculty were similarly "honored".

I hope the AAMC will look into this situation and, if the National Medical Research Matching Program, Inc. is really the very borderline operation that it seems to be, see if its activities can be stopped.

All best wishes.

Sincerely,

Fran

William F. Ganong, M.D.
Lange Professor of Physiology
Chairman, Dept. of Physiology

WFG:jlf

NATIONAL MEDICAL RESEARCHER MATCHING PROGRAM, INC.

1109 MAIN STREET—SUITE C
BOISE, IDAHO 83702

(208) 336-7387
(208) 336-7397

December 28, 1984

Dr. William F. Ganong
Department of Physiology
University of California, San Francisco
S 762
San Francisco, CA 94143

Dear Dr. Ganong:

Enclosed are applications for the position opening of your research program. The applicants are required to communicate directly with you to initiate the particular application procedures for the above mentioned position.

We did not verify the information contained in the applications. Where appropriate, we confirmed that any medical school described in applications is listed in The World Directory of Medical Schools published by the World Health Organization. Because we are only an information service, we recommend that as part of your application procedure you verify the information contained in the applications.

Each applicant certified to us that the information provided in his or her application is true and correct.

The National Medical Researcher Matching Program provides a "nationwide link" between research institutions seeking qualified applicants and those eligible individuals looking for medical research positions. Your courtesy and cooperation is greatly appreciated.

Very truly yours,

Jean K Swanke

Jean K. Swanke,
Executive Secretary
National Medical Researcher
Matching Program

JKS/LLT

Enclosure

association of american medical colleges

MEMORANDUM

November 19, 1984

TO: A. G. Swanson

FROM: Richard R. Randlett

SUBJECT: National Medical Researcher Matching Program (NMRMP)

In response to "Dr. Zyler's request", we have obtained current registration materials for the "NMRMP". These are attached.

It is interesting to note that while the telegraphed request was sent to 690 Market Street in San Francisco, the response did not originate from there; the operation has apparently been moved to 1109 Main Street in Boise, Idaho.

The Conditions, Restrictions and Limitations, although pertaining to the 1984-1985 processing season, have been modified from those we originally received when the operation was located in California. All dates have been moved forward approximately one month. In addition, the wording has changed from a positive stance to one that is less positive. For example, the "NMRMP" was described as a program which matched. It now is described as a program which attempts to match.

If you have any questions, or if we can assist in any additional follow-up , please give me a call.

RRR/pj

Enclosures

Suite 300 / 1776 Massachusetts Ave., N.W. / Washington, D.C. 20036-1989 / (202) 828-0620

Provided by
NATIONAL MEDICAL RESEARCHER
MATCHING PROGRAM, INC.
Boise, Idaho

1109 Main Street, Suite C
P.O. Box 2079
Boise, Idaho 83702
Telephone: (208) 336-7387
(208) 336-7397
Telex: 3717411 NMRMP
Telecopier: (208) 336-1471 NMRMP
Toll Free: (800) 245-1886

THIS IS AN INFORMATIONAL BROCHURE AND NOT A SOLICITATION OF ANY KIND

The National Medical Researcher Matching Program, Inc. was incorporated in Idaho in 1984 and it maintains its new offices at:

1109 Main Street, Suite C
P.O. Box 2079
Boise, Idaho 83702
Telephone: (208) 336-7387
(208) 336-7397
Telex: 3717411 NMRMP
Telecopier: (208) 336-1471 NMRMP
Toll Free: (800) 245-1886

The **National Medical Researcher Matching Program**[SM] is a specially-designed, privately-operated computerized information service that attempts to match professional opportunities in post-doctoral medical research to senior medical students and medical graduates seeking alternatives to clinical positions. Those eligible to register for the program include senior students in medical schools accredited by the AMA's Liaison Committee on Medical Education who are enrolled in schools in the United States and Canada, physicians who have graduated from programs accredited by the Liaison Committee on Medical Education, graduates of foreign medical schools recognized by the World Health Organization, and United States citizens who are in fifth pathway programs.

Many of the eligible individuals apply for clinical positions in the United States. Unfortunately, the number of such clinical positions in each year is **limited**, and some of the eligible individuals are not accepted by a clinical program. Unless these eligible individuals work in a different medical capacity, their training and special expertise may be wasted while they are waiting.

Some of the eligible individuals turn to medical research as an **alternative career.** Although medical research experience can **not** be used to satisfy the post-graduate training requirements for licenture, it provides a unique opportunity for an eligible individual to utilize his or her medical training. However, finding a suitable medical research position can be difficult. Because medical research openings are typically publicized only locally, an individual with limited time and resources may not learn of the research position in his or her specialization and preferred geographic location.

The National Medical Researcher Matching Program is designed to provide a **nationwide** link between research institutions seeking qualified applicants and those eligible individuals looking for medical research positions. We do **not** guarantee employment. Instead, we assist applicants to overcome their geographical and informational limitations by attempting to match each applicant with the available research positions in the applicant's preferred specialization and designated locale, mailing information about the position to the applicant, and providing information about the applicant to the research director of the institution having the research opening.

The specific terms and conditions regarding each research opening vary widely and it is each applicant's responsibility to inquire about salary, term of employment, interviews and other requirements directly from each research director.

Some eligible individuals applying for clinical positions are also hampered by the schedule of the clinical programs, which invariably commence on July 1st and last a full year. Missing the application deadlines or rejections by all the clinical programs in one year often means that an individual must wait a full year for another opportunity to apply. In contrast, research positions become available continuously. Our program provides each applicant with information regarding at least three research opportunities every three months for a year. Each time, it is the applicant's responsibility to use the information to pursue each opportunity.

We plan to conduct research to determine and better specifiy the needs of the group of eligible individuals. By examining these needs, we can hopefully design our program to assist eligible individuals to become contributing members of the meidical researcher community, either in the United States or in the individual's home country.

Foreign medical graduates and students who obtain research experience may return to their home countries and apply the advanced knowledge, improved techniques, and invaluable experience gained from a research position in their specialization. Perhaps more importantly, they may also teach the advanced knowledge and improved techniques in medical research to young doctors in their home countries, thereby improving the medical standards of each country to which they return.

The National Medical Researcher Matching Program, Inc. expressly notifies all applicants in writing that it is not affiliated with the American Medical Association (AMA) or any of the AMA's programs, including the National Resident Matching Program, or with any medical institution, and that research experience may **not** be used to satisfy the postgraduate training requirements for licenture. Since our program is merely an information service, we also expressly advise, in writing, each research director to verify the qualifications of each applicant.

All applicants are strongly urged to use the information provided by our program to actively pursue the available research positions.

NATIONAL MEDICAL RESEARCHER MATCHING PROGRAM

1984-1985

CONDITIONS, RESTRICTIONS AND LIMITATIONS

The National Medical Researcher Matching Program (NMRMP) is a specially designed computerized information service which attempts to match professional opportunities in medical research to senior medical students and medical graduates seeking alternatives to clinical positions. NMRMP also attempts to match applicants to available research positions in major medical institutions nationwide.

NMRMP was established to assist the increasing number of M.D.'s who are turning from clinical to research work because of the greater number of career opportunities in research and the greater challenge to apply what they have learned in their chosen field's research frontiers. Despite the existence of research opportunities, however, many qualified senior medical students and medical graduates are unable to find positions—for example, more than ten thousand foreign-trained M.D.'s in the U.S. are currently working in neither medicine nor medicine-related fields. NMRMP's goal is to match the existing opportunities to the position-seeking senior medical students and medical graduates. NMRMP provides each applicant with information regarding twelve or more position openings in four separate matches in one program year. The openings will be geared to the applicant's preferred field and locale, and each opening will be an opportunity for the applicant to follow up. The process provides the information to allow the applicant to know about and have the opportunity to apply for a research position when the position is available.

NMRMP is not affiliated with the American Medical Association (or National Resident Matching Program) or any medical institution. NMRMP does, however, work with major medical institutions throughout the United States in referring applicants for research openings geared to the applicant's fields of interest and geographic preferences. (Please note: by registering with NMRMP, the applicant authorizes NMRMP to refer the applicant's information to the directors of research programs.)

Conditions of employment vary markedly depending on the particular available position. The applicant should, therefore, inquire about the conditions of employment as part of the applicant's direct communication with the research program directors.

> Most research experience may not be used to satisfy the postgraduate training requirement for licensing, and it is desirable but not necessary for the medical research applicant to have passed the various licensing examinations.

The eligibility of applicants for registering with NMRMP is defined as follows:

- ☐ senior students in medical schools accredited by the Liaison Committee on Medical Education, enrolled in programs leading to a M.D. degree in the United States and Canada;
- ☐ physicians who have graduated from programs accredited by the Liaison Committee on Medical Education;
- ☐ graduates of foreign medical schools which are not accredited by the Liaison Committee on Medical Education but listed in the W.H.O. Directory of Medical Schools; and
- ☐ U.S. citizens who are in a fifth pathway program.

The NMRMP relies on the applicant's absolute compliance with NMRMP's deadline dates in the following program sequence. To participate, adhere to the following precisely:

I. **BY NOVEMBER 30, 1984:**
The NMRMP must have received in its office from each applicant the completed and executed Application for Medical Research Position, the completed and executed Applicant Agreement and the non-refundable fee of $220.

NMRMP requires that applicants include the postcard provided in this packet—stamped and self-addressed—with the application materials and fee so that NMRMP can verify receipt.

II. **BETWEEN DECEMBER 1, 1984 AND JANUARY 31, 1985:**
Based on the information received by NMRMP from applicants and from major medical institutions, NMRMP will conduct a computer analysis of applicant qualifications and preferences as well as requirements of research positions available throughout the country.

III. **BY JANUARY 31, 1985:**
NMRMP will attempt the first match by sending the research program directors the information provided by prospective applicants who meet the qualification requirements and, simultaneously, notifying each qualified applicant of three or more position openings.

THE APPLICANT IS THEN REQUIRED TO IMMEDIATELY COMMUNICATE DIRECTLY WITH THE RESEARCH PROGRAM DIRECTORS TO INITIATE THE PARTICULAR APPLICATION PROCEDURES FOR THE POSITIONS PRESENTED.

IV. **POSTMARKED NO LATER THAN MARCH 22, 1985:**
The applicant is required and honor-bound to notify NMRMP in writing of the status of his or her applications for the research positions from the first attempted match.

V. **BY APRIL 5, 1985:**
Using the same procedures, NMRMP will attempt the second match for each applicant who timely notified NMRMP that he or she failed to secure any of the positions presented to him or her in the first attempt.

VI. **POSTMARKED NO LATER THAN MAY 24, 1985:**
The applicant is required and honor-bound to notify NMRMP in writing of the status of his or her applications for the research positions from the second attempted match.

VII. **BY JUNE 7, 1985:**
Using the same procedures, NMRMP will attempt the third match for each applicant who notified NMRMP that he or she failed to secure any of the positions presented to him or her in the second attempt.

VIII. **POSTMARKED NO LATER THAN JULY 24, 1985:**
The applicant is required and honor-bound to notify NMRMP in writing of the status of his or her applications for the research positions from the third attempted match.

IX. **BY AUGUST 9, 1985:**
Using the same procedures, NMRMP will attempt the fourth and final match for each applicant who notified NMRMP that he or she failed to secure any of the positions presented to him or her in the third attempted match.

X. **BY SEPTEMBER 27, 1985:**
The applicant is required and honor-bound to notify NMRMP in writing of the status of his or her applications for the research positions from the fourth attempted match.

For more information or additional application forms contact:
NATIONAL MEDICAL RESEARCHER MATCHING PROGRAM, INC.
1109 Main Street, Suite C
Boise, Idaho 83702
(208) 336-7387
(208) 336-7397

DRAFT

ASSOCIATION OF AMERICAN MEDICAL COLLEGES

MEMORANDUM #85-

March 4, 1985

TO: Council of Deans
Council of Teaching Hospitals
Council of Academic Societies

FROM: John A. D. Cooper, M.D., Ph.D.

RE: Low-Level Radioactive Waste Disposal -- A Status Report

Overview

As most of you are aware, the Low-Level Radioactive Waste Policy Act of 1980 (LLRWPA) gave states the responsibility for the disposal of low-level radioactive waste generated within their borders. The LLRWPA authorized and encouraged the development of multi-state, regional compacts for the disposal of waste. These compacts could take effect only if approved, i.e., granted formal "consent language", by the Congress. For states lacking disposal sites, progress towards forming regional compacts and developing sites within them has been much slower than anticipated. But now, with January 1, 1986, approaching -- a date by which all states were originally expected by the LLRWPA to have established site access -- the Congress is close to acting on ratification of those compacts which have been submitted. The outcome of the consent process will be extremely important to all biomedical research and patient care activities that employ radioisotopes. Thus, virtually the entire AAMC constituency is affected by this issue.

There have been two chief stumbling blocks towards the negotiation and implementation of the compact system. The first set of snags has occurred in the states, many of which have been reluctant and, in some cases because of the outcomes of referenda, unable to establish or maintain disposal sites. Although these sites are in fact of extremely low risk to human health and safety and the environment, their operation -- proposed or actual -- has almost consistently generated public hysteria. The laggard pace at which a number of states have moved towards developing site access has in turn created the second major obstacle to implementation of the compact system on the Federal level. Under the original terms of the LLRWPA, Congressionally-approved compacts could, as of January 1, 1986, ban the importation of out of region waste into their sites. Clearly, the implementation of such a ban could have disastrous ramifications for the states or regions that lack sites. Thus, legislators from those states without site access have prevented those compacts with sites from moving through the Congress. However, the latter compact groups, and especially the states with operating sites, have grown increasingly insistent about the need for Congressional consent.

The structural polarity of the current compact system, in which only a limited number of states have been able to negotiate access to the existing sites, has given rise to a cat-and-mouse, threat and counter-threat dynamic between those compacts with sites and those without them. While there has been a pronounced element of posturing in the discussions about interregional agreements thus far, it would be unwise to underestimate the resentment that the three states hosting the current sites feel about having to supply <u>all</u> of

the nation's low-level burial capacity. There is a finite possibility that a fed-up state legislature, particularly South Carolina's, might pass legislation that would require the state's site to be closed or restricted to state users alone. Despite all these inter-state hostilities, however, real progress on this issue can only come from the states; the Federal legislature may be able to exert strong pressures to cause interregional negotiations to take place, but it can in no way ensure a stable and happy reconciliation. It is clear that interregional agreements through the early 1990's are an absolute necessity for the nation as a whole. Furthermore, the most pressing need in the low-level area is the development and implementation of new disposal sites; this too is a process that can only advance through state-level actions. It is thus imperative that your state government fully appreciate the stake that your institution has in the successful implementation of the compact system.

Action Needed on the Federal Level

The most significant development thus far on the national level on the low-level radioactive waste subject has been the recent introduction by Rep. Morris K. Udall (D-AZ), Chairman of the Interior and Insular Affairs Committee, of H.R. 1083. As a precondition for the granting of Congressional consent to the three individual compacts with sites, this legislation requires out-of-region access to those sites. Under the Udall proposal, these three compacts would be required to offer access to their sites to all non-sited states or compacts within three months of passage of the legislation; the offer would have to stand for a period of nine months before ratification of the sited compacts could take effect. The two major burial grounds, located in Barnwell, S.C., and Hanford, Washington, would be required to accept from non-compact regions through January 1, 1993, 60 percent of the out-of-region waste volume they received in 1983. Extra charges of $5/cubic foot on this outside waste would be authorized; the charge could be raised to $10/cubic foot for out-of-region waste that exceed the mandatory waste volume. The disposal site in Beatty, Nevada, would also have to increase its waste disposal activities.

The Udall proposal is striking in its absence of further specification about other details of the mandated interregional agreements, and states are given extremely wide latitude to hash out the details of these compromises. This could result in widely differing treatment of regions and the generators within them that may prove chaotic; but overly prescriptive Federal requirements could also cause state-level dissent. While it is very likely that drastic volume reduction or widespread interim storage would be an outcome of adoption of the Udall proposal, H.R. 1083 is deliberately unclear about how this burden should be allocated.

In its January meeting, the AAMC Executive Council endorsed a draft Udall consent proposal as a framework for negotiating interregional agreements. This earlier proposal included waste volume reduction stipulations for those regions without sites, but these were not of the order -- only 10 percent per year incremental drops from the total 1983 level, to be assigned equally to all "have-not" compacts -- of those currently proposed by Rep. Udall. As mentioned, the ire of those regions with sites towards those without them is acute, and growing, and the Udall proposal is undoubtedly a product of a political calculus. Regardless of the specific resolution of this matter, if your institution is in a region without a site (see attachments I and II), it

may well be required to engage in sharp volume reduction techniques including incineration, on-site storage until radioactivity has diminished to background levels, and interim storage, until its compact's site is available.

I urge you to contact your Representatives in support of the Udall proposal as a vehicle for implementation of the compact system; but the terms of support that you advocate must be carefully stated. You should emphasize the social benefits of the patient care and research activities that could not be undertaken, absent the availability of radioisotopes. Furthermore, emphasis should be placed on the special characteristics of academic institutions, that makes it much more difficult for them to reduce the amount of waste they ship -- especially through on-site storage -- that larger generators, particularly nuclear power companies, can. In other words, the need for hospitals and, particularly, biomedical researchers to have maximum access to the limited storage volume that will be allotted to siteless compact regions and states should be stressed. You also should be aware the Rep. Udall's proposal is but the first major move in what almost surely will be a knock-down, drag-out process. For this reason, emphasis on the general need to accomodate health care and research activities is key; the particular provisions of interest to our constituency will only become clear as the consent process develops.

Action Needed on the State Level

Although attention on the radioactive waste issue has lately shifted to the Federal level, a great deal of work still needs to take place in a number of states. And, in cases where a state is already a member of a compact group, intervention is needed to steer negotiators towards the most acceptable national resolution, i.e., one which would allow hospitals and research laboratories to have continued access to existing sites.

Effective action by our constituency on the state level would include making communications to respective Governors' offices and emphasizing the importance of that state -- if it has not done so already -- expeditiously entering into a compact group. If a state is part of a compact group, the need to set in place mutually satisfactory and reasonable interregional agreements should be stressed. The steps to be taken are as follows:

- Acquiring the state's compact legislation, if there is any, from the governor's office.
- Reviewing the compact legislation and conveying any concerns either to state legislators, if the legislation has yet to be ratified, or to members of Congress, if the legislation has already been submitted for federal oversight approval.
- Encouraging the ratification of compact legislation where such has yet to be achieved at the state level; and
- Urging Governors' offices as well as compact commission members to endorse and negotiate interregional agreements. These state and compact representatives will be key players at the national level.

Attachments

For more information on this subject, please contact Mr. David Baime, (202) 828-0525, Dr. Thomas J. Kennedy, Jr., 828-0528, or Dr. Elizabeth M. Short, 828-0480.

States in Which Substantial Compact Activity Needs to Occur

Pennsylvania - Just before the June 30, 1984, deadline to gain membership in the Northeast Compact, Pennsylvania announced its intention to form a two-state compact with West Virginia, with all contiguous states eligible to join. Since that time, a concrete proposal has been developed, and Maryland and Delaware have also expressed their intention to join the compact. Under this Appalachian Compact proposal, Pennsylvania would agree to be the first to develop a regional site, and only when a participating state's waste volume reached 20 percent of Pennsylvania's -- a scenario not likely for the foreseeable future -- would it be obligated to host a site.

Massachusetts - Action in this state, the nation's largest generator of low-level radioactive waste, has been severely hindered by a 1982 referendum that requires any compact arrangement to be approved by the state's voters. Nonetheless, compact negotiations are proceeding, especially with three smaller New England States -- Maine, New Hampshire, and Vermont -- which have been discussing their own compact but may be unable to effect one because of unfavorable economics of scale. However, these states have been reluctant to negotiate with Massachusetts when the latter's ability to follow through on its commitments is so uncertain. A likely timetable for a resolution of Massachusetts' dilemma is still far from definite, and AAMC input in this state, where so much biomedical research occurs, is critical.

South Dakota - A referendum overwhelmingly approved in the November election requires that voters approve of any disposal site through another referendum before its development can proceed. This plebiscite occured just as a major contractor, ChemNuclear, was preparing to develop a site in the southern part of the state. South Dakota does not generate much low-level waste, but the recent vote has thrown that state and North Dakota, who had been considering a bi-state compact, into a quandry.

North Dakota - see South Dakota (above).

Texas - The State is proceeding with development of its own burial site, that by law cannot be used by other states. Under the terms of the LLRWPA, the state's actions do not require Congressional consent. The state hopes to have its site operating in 1988. Texas wants to avoid at all costs becoming "the nation's 4th burial ground," and sources indicate that a slow-down in its site construction process will occur if interregional agreements are mandated. The Udall proposal, however, would not require Texas's site to be shared. The state has ample temporary storage capacity to last until its site is functioning, but has also contacted the 3 regions with existing sites about possible access, in case of delays.

California - The state has formed a bi-state compact with Arizona known as the Western Compact. Progress here continues, and, like Texas, the state's interests will play a critical role in how the compacts move through the Congress. The Western compact died in the Health Subcommittee of the 1984 Assembly, but there are strong indications that the revised version, now pending in the legislature, will be approved early in 1985. Arizona, which had approved the original compact, has also ratified the amended one.

New York - The state has been extremely slow in moving forward, partly because of a lack of action by the Executive branch on this politically thorny issue.

Having rejected the Northeast compact, New York now is most likely to develop its own site; the State Energy Office has outlined the steps necessary to achieve this end. The state legislature currently is waiting for what is called a "government program bill" to be offered by Gov. Cuomo, after unsuccessfully attempting to develop its own proposal. Input in this state is extremely important.

New Jersey, Connecticut - These are the remainder of the 11 states that originally proposed forming a Northeast Compact. Although the states have ratified that compact, little has been done to move forward with selection of a host state and siting studies; much encouragement on this subject is needed. New Jersey still might attempt to join the Appalachian compact. It is unclear what direction Connecticut will take.

Maine, New Hampshire, Rhode Island, Vermont - These states, because of the small amount of waste generated, will very likely need to rely upon a site located in a larger generating state. At this point in time, Massachusetts and New York are the only likely candidates for such an agreement.

EXHIBIT ROOM

Protecting Our Research Resources: Animals and Radioisotopes

Two vitally important biomedical research modalities are being threatened by change from outside the research community: the procurement and use of live animals for experimentation and the disposal of low level nuclear waste. On both issues the involvement of biomedical researchers is vital to the development of appropriate solutions to the problems being debated in legislatures and by the public press throughout the country. This is particularly true of the animal issue, which has been aired in such public forums as Parade Magazine, Hustler, and '60 Minutes' as well as all of the major newspapers. In light of this increasing pressure, the AAMC is urging its member societies to 'get involved'. To assist CAS societies, an exhibit room has been set up at the CAS Spring Meeting with two types of materials: videotapes, pamphlets and resources developed by other scientific groups who support the use of animals in research; and detailed information papers describing the nuclear waste disposal problem and its complex legislative solutions. A resource person from the Foundation for Biomedical Research will be available to answer questions about animals in research and the videotapes which will be shown, include:

- Antivivisection Composite Program
- A Question of Life
- The Value of Animal Research in the Betterment of Health
- Research for Health
- Will I Be All Right Doctor?

You are urged to come in and view the films and to ask questions. This is an excellent opportunity to begin to formulate your society's position on these important issues.

Please visit the 'Calvert Room' next to the main meeting room to obtain your copies of the hand-out materials and view the video-tapes. The 'Calvert Room' will be open throughout the CAS Spring Meeting.

AAMC STATEMENT ON ANIMAL RESEARCH

Efforts to restrict or eliminate all forms of animal research have become increasingly vocal and political in the past year. As a result, it has become vitally important to the future advancement of biomedical knowledge and health care that the views of biomedical researchers be heard on the use of animals in research. Academic societies need to have a formal position statement on the use of animals in research, and to espouse the need for animals in public forums. The CAS Administrative Board approved the following statement at its 1984 September Board meeting. It was adopted by the AAMC Executive Council January 24, 1985. Endorsement of the position by each CAS society would enhance its impact and usefulness in lobbying against new federal legislative initiatives. Therefore, each academic society is asked to give this statement due consideration and to adopt it as soon as possible.

> The Association of American Medical Colleges strongly affirms the essential and irreplaceable role that research and education involving live animals has in the advance of biological knowledge, human health and animal welfare. The AAMC recognizes the responsibility of the academic medical community to ensure that the care and use of animals in laboratory research and medical education are conducted in a judicious, responsible, and humane manner. It is the Association's firm belief that any efforts to impose further restrictions on the use of live animals in biomedical and behavioral research and education would seriously compromise progress in health care and disease prevention. Therefore, the Council supports the continued availability and humane use of live animals in scientific research and medical education.

If your society has already adopted a statement regarding the use of animals in research, would you please forward a copy to the CAS Office. If not, we urge you to develop a formal position for your society as soon as possible.

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1984 - 1985

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+ Representative to AAMC Executive Council

FUTURE MEETINGS

CAS Administrative Board Meetings

April 3-4, 1985	Washington Hilton Hotel
June 19-20, 1985	Washington Hilton Hotel
September 11-12, 1985	Washington Hilton Hotel

CAS Spring Meeting

March 6-7, 1986	Washington Hilton Hotel

AAMC Annual Meetings

October 26-31, 1985	Washington Hilton Hotel
October 25-30, 1986	New Orleans, Louisiana

CAS SPRING MEETING
March 14-15, 1985

Supporting Graduate Education in the Biomedical Sciences

Thursday, March 14

10 a.m. - Noon — Supporting Graduate Doctoral Education

Predoctoral Education of Ph.D.s

Robert M. Bock, Ph.D.
Dean, Graduate School, U. of Wisconsin-Madison
Chair, Basic Biomedical Sciences Panel
IOM Committee on Research Personnel

Postdoctoral Ph.D. Education

Frank G. Standaert, M.D.
Chair, Pharmacology, Georgetown University
Member, Basic Biomedical Sciences Panel

Noon - 1:30 p.m. — LUNCH

1:30 p.m. - 3 p.m. — Supporting Graduate Medical Education

Subspecialty Clinical/Research Training for MDs

Harold J. Fallon, M.D.
Chair, Internal Medicine, Medical College of Virginia
Chairman, Residency Review Committee, Internal Medicine

Research Training for MDs

James B. Wyngaarden, MD
Director, National Institutes of Health

3 p.m. - 4:30 p.m. — DISCUSSION GROUPS

4:30 p.m. - 5:30 p.m. — Financing Graduate Medical Education

Report from AAMC Ad Hoc Committee on Residency Training

J. Robert Buchanan, MD
General Director, Massachusetts General Hospital
Chairman, AAMC Committee

5:30 p.m. - 7:30 p.m. — RECEPTION

Friday, March 15

8:30 a.m. - Noon — BUSINESS MEETING

CAS SPRING MEETING
March 14-15, 1985

Supporting
~~Financing~~ Graduate Education in the Biomedical Sciences

Thursday, March 14

10 a.m. - Noon — Supporting ~~Financing~~ Graduate Doctoral Education

Predoctoral Education of Ph.Ds

Robert M. Bock PhD
Dean, graduate School, U. Wisconsin-Madison
Chair, Basic Biomedical Sciences Panel IOM Committee on Research Personnel

Postdoctoral Ph.D. Education

Robert T. Hill PhD
Chair, Biochemistry, Duke University
Chair, IOM Committee on National Needs for Biomedical & Behavioral Research Personnel

Noon - 1:30 p.m. — Lunch

1:30 p.m. - 3 p.m. — Supporting ~~Financing~~ Graduate Medical Education

Subspecialty Clinical/Research Training for MDs

Research Training for MDs

B.
Jim Wyngaarden, MD
Director, NIH

3 p.m. - 4:30 p.m. — Discussion Groups

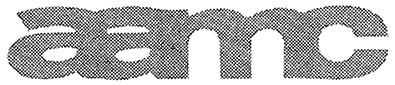
4:30 p.m. - 5:30 p.m. — Financing Graduate Medical Education ~~Report~~ Next line from the AAMC Ad Hoc Committee on Residency Training

J. Robert Buchanan MD
General Director, Mass. General Hospital
Chairman, AAMC Committee

5:30 p.m. - 7:30 p.m. — Reception

Friday, March 15

8:30 a.m. - Noon — Business Meeting



1985 SPRING MEETING OF THE COUNCIL OF ACADEMIC SOCIETIES

March 14–15, 1985
Washington, D.C.

Support for Graduate Education in the Biomedical/Biobehavioral Sciences

Program and Registration Information

1985 SPRING MEETING of the COUNCIL OF ACADEMIC SOCIETIES

March 14–15, 1985
Washington, D.C.

PROGRAM

Support for Graduate Education in the Biomedical/Biobehavioral Sciences

Thursday, March 14

10:00 am–12:00 pm
PLENARY SESSION

INTRODUCTIONS

John A.D. Cooper, M.D.
President, AAMC

Virginia V. Weldon, M.D.
Chairman, CAS, AAMC

SUPPORT FOR GRADUATE DOCTORAL EDUCATION

Predoctoral Ph.D. Education

Robert M. Bock, Ph.D., Dean,
Graduate School, U. of Wisconsin
Chair, Basic Biomedical Sciences Panel
IOM Committee on Research Personnel

Postdoctoral Ph.D. Education

Frank G. Standaert, M.D., Chair
Pharmacology, Georgetown University
Member, Basic Biomedical Sciences Panel
IOM Committee on Research Personnel

12:00–1:30 p.m.
LUNCHEON

1:30 p.m.–3:00 p.m.
PLENARY SESSION

SUPPORT FOR GRADUATE MEDICAL EDUCATION

Subspecialty Clinical/Research Training for M.D.s

Harold J. Fallon, M.D.
Chair, Internal Medicine, Medical College of Virginia
Chairman, Residency Review Committee, Internal Medicine

Research Training for M.D.s

James B. Wyngaarden, M.D.
Director, National Institutes of Health

3:00 p.m.–4:30 p.m.
DISCUSSION GROUPS

Predoctoral Education of Ph.D.s

Postdoctoral Ph.D. Education

Subspecialty Clinical/Research Training for M.D.s

Research Training for M.D.s

4:30 p.m.–5:30 p.m.
PLENARY SESSION

FINANCING GRADUATE MEDICAL EDUCATION

Report from the AAMC Ad Hoc Committee on Residency Training

J. Robert Buchanan, M.D.
General Director, Massachusetts General Hospital
Chairman, AAMC Committee

5:30 p.m.–7:30 p.m.
RECEPTION

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Friday, March 15, 1985

9:00 a.m.–12:00 p.m.
CAS BUSINESS MEETING

HOTEL RESERVATIONS

Please complete the enclosed reservation form and return to the Sheraton Washington by Feb. 13.

MEETING REGISTRATION

Please tear off and complete the meeting registration form and return by March 1 to:

Ms. Carolyn Demorest
Division of Biomedical Research
and Faculty Development
AAMC
One Dupont Circle, N.W. #200
Washington, D.C. 20036

Questions may be directed to Ms. Demorest 202-828-0480.

Please Print

1985 CAS SPRING MEETING REGISTRATION FORM

Please Enclose Registration Fee and Return by March 1, 1985

Society: _____

Name: _____

Address: _____

_____

_____

Please place a "1" next to your first choice discussion group and a "2" next to your second choice.

_____ Predoctoral Ph.D. Education

_____ Postdoctoral Ph.D. Education

_____ Clinical Fellowships for M.D.s

_____ Research Training for M.D.s

To cover the costs of the luncheon and reception, a registration fee of $25 is being charged. Please enclose a check made payable to "AAMC" with this registration form.

SUPPORT FOR GRADUATE EDUCATION IN BIOMEDICAL AND BEHAVIORAL RESEARCH

COUNCIL OF ACADEMIC SOCIETIES

SPRING MEETING 1985

aamc association of american medical colleges

SUPPORT FOR GRADUATE EDUCATION IN BIOMEDICAL AND BEHAVIORAL RESEARCH

COUNCIL OF ACADEMIC SOCIETIES

SPRING MEETING 1985

Table of Contents

Research Training in the Biomedical Sciences:

an Overview of Strengths and Vulnerabilities

Nowhere is the complexity of biologic systems and the sophistication needed to perform research in the biomedical sciences as clearly demonstrated as in the program required to prepare a young aspirant to become a creative and contributing investigator in the biomedical or biobehavioral sciences. Such research training now requires at least a decade of advanced study after receipt of the baccalaureate degree. For the Ph.D. the average is 7.5 years to obtain the doctoral degree and three years of postdoctoral training. For the M.D. who seeks a research career, a base of four years of medical school and at least three years of residency training is necessary before embarking on actual research training, which, undertaken in coordination with advanced subspecialty training, can easily take at least three years. This enormous personal commitment on the part of the aspiring scientist, with no guarantee that he will ultimately prove capable of self-sustained research creativity, must be matched by an intensive commitment of the personnel and laboratory resources necessary to accomplish this highly individualized training process. One somehow has a sense that the scale of this effort is as great as its intensity.

Yet, in actuality, reasonably reliable estimates drawn from multiple sources by the speakers in this symposium indicate that if one seeks fully trained, independent investigators, this nation is producing perhaps 2200 such fully-trained Ph.D.s, 1200 research M.D.s and 150 M.D./Ph.D.s per year. Some

smaller number of people may receive a portion of this training and thereafter contribute, in varying capacities, to biomedical research.

Not only are the devoted individual attentions of research mentors and the full facilities of top flight academic research laboratories and clinics necessary to train this critical cadre of future investigators, but a wide array of funding sources must be tapped to obtain funding for the stipends of these graduate and postdoctoral students, the tuition of the degree candidates, and, where possible, some modicum of support for the research training sites themselves. The degree to which these years of training are an apprenticeship in which the trainee learns while participating actively in the laboratory or clinical work, is reflected in the sources of funding. In the major university training programs, research project funds support 30 percent of bioscience Ph.D. candidates and 42 percent of postdoctorals; patient care revenues support perhaps 65 percent of advanced subspecialty M.D training. These funding sources both tie the trainees to duties which may or may not contribute optimally to their research training and make the national training effort vulnerable to unrelated funding perturbations such as those which occur in the individual grant renewal process or when proposals are made to preclude the use of Medicare hospital funds to support subspecialty training.

That portion of the diverse resources supporting the education of future biomedical investigators which is specifically designated for training in research thus plays a crucial role in the entire support system. Federal support represents a significant portion of all funds specifically dedicated to doctoral and postdoctoral training in the biologic sciences, ranging in 1983 from 12 to 15 percent of support for Ph.D.s trainees to 34 percent of Ph.D. postdoctoral support, and 45 percent of support for M.D. postdoctoral research training. Other sources of support such as teaching assistantships for Ph.D.

candidates, or private foundation or industrial programs for some postdoctorals provide a range of support mechanisms which assure a desirable heterogeneity and flexibility in the system.

What are the particular vulnerabilities of this current system of research training in the basic and clinical biomedical sciences? A number are identified by speakers in this symposium. First, and most potentially worrisome is the decline in the number of young people receiving a baccalaureate degree in biosciences from 5.5 percent to 4.1 percent of all college degrees awarded. A predictable result of this trend is the 9 percent decline in medical school applicants in 1985.

A further vulnerability is the clear dependence on federal resources to sustain the current scale of graduate training programs; a scale which has in large measure contributed to our international leadership in the biological and biomedical sciences. Over half of all training resources at our major graduate school sites are federal, either through direct training support or research grants which incidentally employ trainees. Should the federal resolve to make this investment in the advance of biologic knowledge and health research weaken, no other source could assume this burden.

Within the overall federal investment, there should be concern that research grants not become the dominant source of funds. Their merits and weaknesses are well rehearsed by our speakers; they are an important resource but not always congruent with optimal educational experiences. The NAS Committee on Personnel Needs in Biomedical and Behavioral Research has always strongly recommended that the major federal investment should be directly in institutional training grants.

These crucial federal training grants and fellowships have another potential vulnerability; with the exception of a few NSF programs, the major federal training effort in the biomedical sciences is based in a single law, the National Research Service Awards Act, first enacted in 1974 when an administration doubting the wisdom of federal investment in biomedical research training stripped the NIH of the authority it had had since its inception to make grants for research and research training. This vulnerability to a single law has been amply demonstrated by repeated battles over its reauthorization and resulting limitations of training appropriations. Onerous as well is the provision in this law that a trainee must pay back in future work or return of funds the training stipend awarded him by merit and earned as well by contributing to the national research effort during training. This payback provision is widely held to discourage some fraction of our bright young people from essaying the perils and pleasures of a research career.

One of the touted strengths of the American scientific system is that research training and cutting edge scientific research proceed hand-in-hand in our premier academic institutions. The synergy made possible by this confluence of learning, doing, and teaching is universally believed to contribute to our preeminence. Some 90 percent of our biomedical scientists are trained in the top 100 of these research institutions and their medical schools. Does this concentration of training to a cadre of our universities introduce a vulnerability? Perhaps, but the prolonged, personalized, highly sophisticated education we are discussing is best accomplished where the best research is being done, where the best mentors and facilities are, and where the enormous resources, often extending to access to major medical school teaching hospitals, are concentrated. It is a measure of the wealth of this nation that

there are at least 100 such centers of excellence and perhaps unwise that the present limited resources or the trainees be dispersed more thinly.

Two areas in which we must continue and expand our efforts in training are in insuring an adequate supply of scientists such as geneticists or immunologists, with the disciplinary skills necessary to capitalize on the recent advances in molecular biology, and in training a large enough cadre of M.D. investigators to insure a fruitful link between basic biological research and improvement of human health. Specially tailored support mechanisms and greater investment in current mechanisms may be necessary to produce greater numbers of Ph.D. investigators who combine generic training in the classic disciplines and interdisciplinary training, with specific methodologic training in these new areas. Such generic and broad based training is critical to enable these young people to remain at the forefront of rapidly advancing and changing research frontiers. M.D. scientists represent, as they have for some years now, a valued but endangered resource. The long years of arduous clinical and research training, the debt burdens of many graduating M.D.s, their difficulty in competing with full time research Ph.D.s for limited research grant funding, and the increasing pressures to contribute to sustaining the patient base of their medical centers combine to discourage many capable people from careers in clinical research. Special programs to assist in recruitment and retention of M.D. scientists are critically needed. A number of NIH initiatives are reviewed in this symposium; their combined effort may have stemmed the sharp decline in M.D. trainees apparent in the late 1970s, but the problems of the low numbers of M.D. trainees and their ability to sustain research careers have not yet been reversed.

AAMC
July 1985

Elizabeth M. Short, M.D.
Director
Division of Biomedical Research

The Council of Academic Societies of the Association of American Medical Colleges held its 1985 Spring meeting on March 14 and 15 in Washington, D.C. The plenary session, Support for Graduate Education in the Biomedical/ Biobehavioral Sciences, was designed to address both current public policy concerns about financing graduate education in the biomedical/biobehavioral sciences and the changing educational environment for M.D.s and Ph.D.s. The four speakers were chosen because of their considerable background and expertise with these issues.

Robert M. Bock, Ph.D. is Professor of Biochemistry and Molecular Biology and Dean of the Graduate School at the University of Wisconsin, Madison. He is the chairman of the Basic Biomedical Sciences Panel of the Institute of Medicine Committee on National Needs for Biomedical and Behavioral Research Personnel and a member of the National Academy of Sciences (NAS) committee to evaluate the quality of the research doctorate. His national contributions have included chairing a NAS committee on the vitality of academic research, which published a report entitled, "Research Excellence to the Year 2000", and reviewing the Science and Technology Education Plan of South Korea for the World Bank. He currently serves on a NAS committee to evaluate scholarly exchange with the People's Republic of China.

Frank G. Standaert, M.D. is Professor and Chairman of Pharmacology at Georgetown University Hospital. He is a member of the Basic Biomedical Sciences Panel of the Institute of Medicine Committee on National Needs for Biomedical and Behavioral Research Personnel. He currently serves on the National Research Council Committee on Recommendations for U.S. Army Basic Scientific Research, the NIH Biotechnology Resources Review Committee and the National Board of Medical Examiners Pharmacology Committee.

Harold J. Fallon, M.D. is Professor of Medicine and Chairman of the Department of Medicine at Virginia Commonwealth University, Medical College of Virginia. He is chairman of the Internal Medicine Residency Review Committee and a member of the American Board of Internal Medicine. He serves on numerous editorial boards, councils and committees, including the Council of the Association of Program Directors of Internal Medicine and the Advisory Council for the National Institute of Arthritis, Diabetes, Digestive and Kidney Diseases.

Doris H. Merritt, M.D. is Research Training and Research Resources Officer at the National Institutes of Health and Special Assistant to the Director NIH. Before returning to NIH full-time in 1978, she was Professor of Pediatrics and Dean for Research and Sponsored Programs at Indiana-Purdue University in Indianapolis. At NIH she has multiple responsibilities but is particularly knowledgeable about the overall NIH effort in research training through the National Research Service Award program and the Career Development awards.

Support for Graduate Doctoral Education: Predoctoral Ph.D. Education

Robert M. Bock, Ph.D.

As background information to a discussion of the different mechanisms of support for predoctoral Ph.D. education, I will first describe the general characteristics of the current Ph.D. output. The graduation rate for Ph.D.s in all areas of science and engineering is approximately 18,000 per year, which is three times the number in 1960. Of these, approximately 4,800 per year receive degrees in the biological and agricultural sciences. However, when these graduates are viewed as a percentage of their age cohort, this growth rate is not as impressive as it first appears. In 1960, 0.15 percent of the U.S. age cohort achieved a Ph.D.; in 1983 it was 0.3 percent. The growth can be attributed almost entirely to two groups: the increased participation of women in Ph.D. training and the increased proportion of foreign nationals graduating from American universities. The percentage of American males graduating has actually decreased in the last 15 years. We have undergone a shift, much of which was needed in order to extend equal opportunity to underrepresented groups. We were not creating optimum opportunities for scientific and engineering personnel when women were excluded because of habit, tradition, or perception. In the life sciences the percentage of female Ph.D. recipients has risen to 27 percent, accounting for almost all of the increase in graduates within the last decade. (Figure 1)

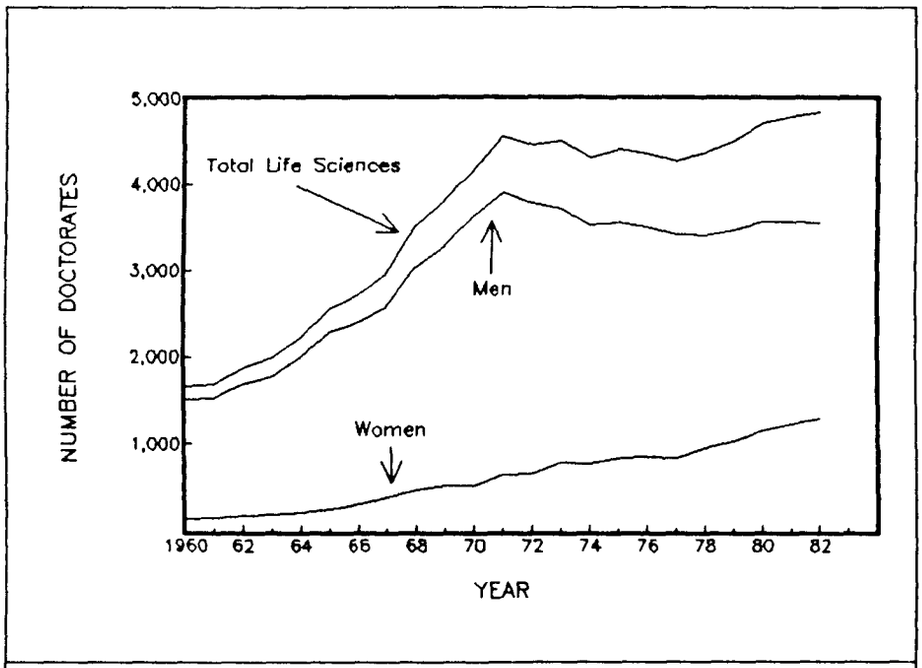


Figure 1: Life science doctorates granted to women increased each year while the number of new male Ph.D.s have remained relatively constant.

Source: National Science Foundation and National Research Council, Science and Engineering Doctorates 1960 – 1982; NSF Publication #83-328

Maintenance of sufficient numbers of new doctorates is dependent on the high school graduates entering scientific curricula in our universities. These young science majors provide the college graduate pool from which our biomedical researchers are selected for Ph.D. training. In the 1980s, approximately 50 percent of all children born will be in ethnic minority groups which are currently underrepresented in the Ph.D. researcher population and in the science bachelors pool from which these researchers are selected. Unless our society provides educational opportunities adequate to prepare this new generation to pursue advanced scientific training, the nation will face in the year 2000 biomedical and scientific research needs greater than can be served by the pool of adequately prepared young people.

Another notable characteristic of the Ph.D. output is the wide variation in the numbers of graduates among fields. The bioscience field with the largest percentage growth at the current time is immunology, followed closely by the neurosciences, and for the last decade, molecular biology. These three disciplines have all had real growth in Ph.D. output. Many other areas are stable and a few have declined; e.g. biophysics has actually declined in Ph.D. output over the last decade. It is interesting to note that the output from all of the life sciences Ph.D. programs combined only equals the Ph.D.s awarded yearly in psychology and the behavioral sciences. Without a doubt, the largest single field is psychology. In fact, the next four or five fields combined barely equal the number of psychology Ph.D.s graduated each year.

Any discussion of support for Ph.D. education must recognize not only the variations in size between fields, but also the tremendous diversity in support patterns between fields. For example, in psychology, support from research grants and training grants is quite modest compared to that from teaching assistantships. This paper will specifically examine the support mechanisms that are utilized in the biomedical and life sciences.

The competition for the principal sources of support varies widely by institution as well as by field. The distribution of Ph.D.s awarded is uneven among the schools, with two-thirds being awarded by the top 50 Ph.D. producing schools and 90 percent by the top 100 schools. This paper will be descriptive of the characteristics of these top 50 schools, rather than trying to encompass the entire Ph.D. producing universe.

Current enrollment in graduate science and technology programs is on the order of 400,000 persons of whom one-third are in programs leading to the Ph.D. The principal categories of research support for these Ph.D. candidates are the

research assistantship, the teaching assistantship, and the NIH research traineeship. According to my analysis, research assistantships provide the largest single fraction of support in the life sciences, with about 30 percent of all students supported as research assistants. The NIH is the primary source of funds for research assistantships and the National Science Foundation is second. A substantial number of graduate students are now being supported on grants from industry, primarily the pharmaceutical, and more recently, the biotechnology-related companies. Other sources of research support include philanthropic foundations, state and university endowment-based fellowships or research assistantships, and a variety of miscellaneous sources (see Table 1).

Table 1

SUPPORT FOR PREDOCTORAL PH.D. EDUCATION IN THE BIOMEDICAL SCIENCES

Support Mechanism	Approximate % of Total Support
Research Assistantship	30 %
Teaching Assistantship	20–35
Research Traineeship	15
National Science Foundation fellowship	<5
Loan programs	5
Philanthropic institution–based fellowships	3
Other	
Federal programs in targeted need areas	
Work–study programs	
Industry–institution relationships	

Percentage support is based on information from the top 50 Ph.D. producing schools which produce two–thirds of the new doctorates. There is wide diversity between public and private institutions and between departments.

What are the advantages of a research assistantship? From the university's perspective, research assistantships are a stable and beneficial source for funding a high quality graduate program. Quality is maintained through the peer review process, with funds awarded to the principal investigators who

write the best proposals, who have the best track records, and who are therefore excellent models for the current and coming generations of researchers. The principal investigator decides the best strategy to expend the research dollars to achieve a recognized output, such as publications in peer reviewed journals, that will help ensure the success of future grant applications. Stipend policies are established at the institutional level so there can be local decisions concerning the cost of living in the area, rather than an average of all institutional competitors. Policies for tuition and indirect costs are negotiated between the federal government and the institution, but in general they are covered in a manner that is acceptable to both the auditors and the institution. Indirect costs are calculated on a base that includes the stipends of research assistants; thus their presence contributes to maintenance of the overall research environment.

For the research assistant there is another advantage to this type of support. In most university appointment structures, a research assistantship will automatically qualify the graduate student for the institutional health insurance policy. This is a very valuable benefit because of the cost of health care and the substantial fraction of Ph.D. candidates who are married.

There is one disadvantage for the research assistant; instability of the funding. The large volume of research assistantships makes this a stable source of support from the overall perspective of the university, but when you look at the microcosm of one research group or one student, it is unstable. This year, for example, there is great uncertainty for those students relying on a research grant renewal from NIH because of the mid-year change in the number of grants OMB will permit NIH to support. Both NIH and NSF, the two principal supporters of biomedical research, are concerned about grant stability and are considering increasing the length of the research grant. An

increase from two or three years to five years would greatly improve stability of planning for the principal investigator and for the graduate student who is entering into a serious in-depth research problem.

In the top 50 research institutions the teaching assistantship is the second principal source of support for graduate students. Teaching assistantships range from 20 to 35 percent of the support for graduate students, depending on the type of school. The availability of and need for teaching assistants (TAs) is tremendously diverse even within one institution and differs dramatically between public and private institutions. State institutions, in general, expend almost twice as large a fraction of their instructional support through teaching assistantships as do private institutions; consequently, more TAs are supported in state institutions than in private institutions. Between departments the diversity is even greater. In colleges of arts and sciences, the fraction of Ph.D. candidate students supported as teaching assistants may be three times as great as in the basic sciences in a medical school. This is because of the increased need for TAs to teach large undergraduate sections of chemistry, math, physics, biology, zoology and botany, compared to some of the new areas of the medical sciences, which focus on a narrow subfield such as neuroscience or immunology, and have less need for large numbers of TAs. One should also recognize the wide diversity that exists in the work demands of different teaching assistantships, especially for the TAs instructing large undergraduate classes.

What are the advantages and disadvantages of the teaching assistantship as a source of support for graduate education of Ph.D.s? Certainly it is an important part of training faculty for the future and helps the institution keep its vitality. Teaching assistants are often very good instructors who relate well to the students, who are only a few years younger. But there are

some disadvantages. It is a time consuming activity. Teaching assignments can be very disruptive if they coincide with deadlines on a research project or grant application. Such a student might be a negative asset to the research unit because he or she is occupying lab space, but is not using it fully while teaching the undergraduate laboratory. For students there is the financial disadvantage that a teaching assistant appointment is taxable, which results in a higher cost to the student. Some institutions avoid the tax problem by requiring a teaching experience of every degree candidate, in which case the appointment can be defended as a teaching fellowship and is non-taxable.

Now we come to one of the most beloved, defended, and argued about sources for graduate support and that is the federal research traineeship. The National Institutes of Health have been the inventor and promulgator of a longstanding and very successful research training program. The magnitude and percentage of support provided through the training grant mechanism has varied dramatically over the years. At one time not only were the numbers of predoctoral students supported by NIH twice as large a percentage of the predoctoral Ph.D. cohort as they are today, but the training grant was sufficiently well funded that it had a tremendous impact on the quality of the entire graduate program. The non-stipend portion of the grant enriched the entire training milieu, providing the opportunity for guest lecturers, for books and for travel to scientific meetings by the trainees.

In 1974 the National Research Service Awards Act was passed by Congress to markedly restructure, affirm, defend, and codify the commitment of NIH to training the researchers of the future. In the last decade, pressure on the available funds has led to a shift of almost all the training monies into direct costs such as tuition and trainee stipends in order to try to support

the same number of trainees on diminishing dollars. This pressure to preserve the number of trainees has necessitated very dramatic cuts in the allowable "indirect" or institutional support for the training program. Today with a maximum of 8 percent administrative costs, that support averages about 30 percent of the amount per trainee that it did at the peak. However, it is still a very important supplement, enriching the training environment in the departments and schools that are fortunate enough to have a training grant.

About 15 percent of life science/behavioral science Ph.D. candidates are now supported by the NIH predoctoral training grant program. What are some of the advantages of this category of support? The great advantage is that these grants are typically five-year institutional grants with a good probability of renewal if performance is high. Because of this stable support and because these grants are specifically addressed to the research training mission, the training setting can be carefully planned. The NIH predoctoral training grant provides for a more careful balance of training activities than is possible with an individual research assistantship, thus assuring that the student is well trained in the central discipline of the training grant as well as the specific methodology of his research group. Analyses of productivity of graduates of this research training program are very gratifying. Students who have had the benefit of training grant support outperform those trained by any other broad category of support mechanism as judged by output of peer reviewed publications per individual, scores on competitive research grants, and the probability of staying in biomedical research. Because this program outperforms any other sources of support by a modest but significant increment, it is a very valued program for research training.

In general the training grant has a substantial cost/benefit for the institution. It is efficient and well run, with trainees progressing through

the program in a timely manner. However, the stipend levels are under control of the NIH and have lagged behind the stipends that are common for research assistants and fellows funded by other agencies. While this means an economy for the supporting agency, for most institutions non-federal funds must be found to supplement the grant or other institutional mechanisms must be used to keep the trainee from being disadvantaged compared to other research assistants funded by NSF or other sources.

Another problem currently facing the training grants and their administration is tuition costs, which have recently become a larger and more visible percentage of grant costs. Both stipends and the enrichment program have been held down or cut back in recent years, but tuition has been paid at the level set by the institution. While it is true that tuition is tied to some given percentage of the instructional costs, it has risen at or above the national cost of living index, and has become an ever larger fraction of the training grant budget. In order to limit its tuition commitment, NIH is currently proposing that the actual institutional tuition in the initial grant year be taken as the base, and that out year tuition support be limited to a maximum of 6 percent annual increments above the base. If inflation is controlled, I think tuition increases can stay within that 6 percent increment. However, if institutions experience substantial inflationary costs, then tuition increases will exceed this new ceiling and NIH training grants will no longer cover the actual share of institutional costs for which tuition is intended.

A disadvantage of the NIH training grant for the trainee is the payback requirement. The payback clause in the NRSA legislation is seen by an entering student as a potential problem. Each research trainee must sign a commitment to return the money that supported their education if they opt to choose a career outside of research. The payback provision is much more of a

threat than a reality; in fact, very little money has been paid back to date. Perhaps its very existence makes students vote with their feet if they have any question about their career choice. The payback provision was enacted to counter accusations that federal training support was being used to enhance the skills of future high income professionals rather than to increase the number of research scientists. The provision has the political advantage that it is currently possible to certify that these monies will not be wasted on non-researchers because they will be paid back to the taxpayers if the trainee does not become a researcher. There are studies underway to examine the impact of the payback requirement on research career recruitment and the need to continue this requirement. It may change in the future, but politically the payback clause was the savior of the stable training grant program at the time of its enactment in 1974.

The NIH research training grants also support the only national program for combined M.D./Ph.D. candidates, a program which currently enrolls just under 700 medical scientist trainees. Such candidates participate in a planned and coordinated graduate training program, enabling them to attain both the M.D. and the Ph.D. degrees. This Medical Scientist Training Program (MSTP) has had a very high priority from the National Research Council and has been strongly supported by the Institute of Medicine Committee that reviews the National Research Service Act and recommends to Congress what the federal role should be in research training in the medical sciences. These physician-investigators are building a very important bridge between basic science and clinical applications for the solution of health problems and provide both the interface and the conduit for new information into health care.

The number of MSTP trainees is modest and the quality of the applicants who cannot be accommodated is high, so that if resources were available the program could fruitfully be expanded. While the present national investment in 700 trainees should clearly be sustained, the National Advisory Committee has recommended every year that a greater number of M.D/Ph.D.s should be trained. However, there are problems in implementing this recommendation. Because of the greater length of the M.D./Ph.D. program compared to the Ph.D. only, the costs per graduate are substantially higher. In addition, medical school tuition costs are generally higher than graduate school tuition costs. The projection for 1986 is that it will cost $15,000 per year per predoctoral Ph.D. trainee, combining stipend, tuition, and ancillary allowable training costs. However, for the MSTP trainee the costs will be $19,000 per year per trainee. Furthermore, the medical scientist trainee is permitted to participate for up to six years in this program. Some training time may be spent as a research assistant or as a fellow, so not all MSTP trainees use the maximum six years, but most do. For the predoctoral Ph.D. training program, there is a maximum of three years support per trainee, with permission to extend support in extenuating circumstances. The average appointment to the Ph.D. training grant is only two years. The result is that the cost per graduate is more than twice as great for the M.D./Ph.D. as for the Ph.D. training track. In addition to this substantial commitment of NIH training funds, the MSTP program requires an institutional commitment of time, attention, and devotion to the concept. The institution must find the research training opportunities and coordinate the trainees as well as provide flexibility in the M.D. program to permit these students to maximize the research portion of their training. Nevertheless, the physician-scientist plays such an important role in medical research that the program should be

defended in those training sites which are well managed and produce outstanding products.

Predoctoral Ph.D. education also is supported by other mechanisms. National Science Foundation fellowships are a very valuable mechanism of support and are used quite extensively in the biomedical sciences. These fellowships have certain distinct advantages: they go to top students, they support a three-year program, and they have a high stipend (currently $10,000 per year). They also are "portable" which is both an advantage and a disadvantage. NSF fellows flow to the most attractive institutions in a particular field. That makes the strong stronger, as the NSF fellows go to the schools with the best reputations. The disadvantage is that because only a few schools in a limited number of states have highly competitive programs, NSF fellows are not evenly distributed. Those universities without such programs lobby against the "portable fellowship" concept. However, I think that because the fraction of the graduate student population supported as NSF fellows is less than 5 percent, it is not a misuse of federal funds to recognize quality and let these top caliber students go where they think they can get the best training. Another disadvantage of the NSF fellowship is that tuition costs and the indirect costs of supporting the training program must come entirely out of the institutional allotment. In many state institutions and almost all private institutions the institutional allotment is less than the tuition alone. As a result, institutions have to decide whether to accept these good students who have three years of stipend support, without a mechanism to collect full tuition from their grants. Accepting NSF fellows is a major cost to schools such as Harvard, Stanford, Johns Hopkins, and MIT, where many NSF fellows want to go and where the tuition rate may be double the institutional allotment.

A number of other federal agencies have modest fellowship activities. The U.S. Department of Agriculture has recently begun a fellowship program in targeted areas of national need. The Office of Education has the Graduate Professional Opportunities Program (GPOP), which is modest in size and is intended to provide high quality Ph.D. training to minority students. There also are programs within NSF and NIH that address the particular problems of initiating access to research experiences for minority students so that they will have a chance to move into the mainstream of biomedical research. In addition, these programs provide an important component of the overall research support.

Institutions also look to the alumni, to their friends, and to philanthropic foundations for student support, primarily through the fellowship mechanism. This is an important source of support, which varies greatly by institution. Nationally, only about 3 percent of the graduate student support comes through institution-based fellowships, but in some schools it may be much greater than that.

There has been some substantial growth in the interest of industry in insuring that high quality students continue to be trained, especially in the new areas of science that they see as future needs. Where these relationships are established between specific companies and schools, e.g., Monsanto with universities in St. Louis and Boston, they do bring quite substantial graduate student support for the institutions. They are not a general solution, because such arrangements are difficult to negotiate and are not widely available but they do have a significant role and have grown over the last few years.

There are other large student support activities that have only a modest impact on Ph.D. training in the biomedical sciences. One example is the work-study program. The dollars paid per year nationally in work-study support dwarf the combined NSF and NIH training activities; however, their impact on Ph.D. training is very modest. Bureaucratic requirements have been erected that make it difficult for the graduate student to benefit at a level that is comparable to current stipend levels for research assistantships and NSF fellows. A few universities have established work study programs for Ph.D. candidates, but they are the exception not the rule. Northwestern University has done this quite successfully, but financial aid officers at most universities direct work-study support to undergraduates as the first target.

What about loan programs? We are all aware of the enormous public policy debate about the cost and magnitude of loan programs for education. The principal loan program impact on Ph.D. candidates in the sciences is the debt incurred as undergraduates. About 10 percent to 12 percent of students come into graduate school with a substantial loan burden, which is deferred until they have finished their Ph.D. program. The fraction of biomedical research graduate students who participate in further loan programs is well under 10 percent. In a typical institution perhaps 5 percent of Ph.D. candidates have to continue to obtain loan support. Usually these are cases where there are unusual family costs, forcing the student to supplement the support available to research assistants, teaching assistants, or trainees. Although the loan programs are a fundamental building block of undergraduate educational opportunity and of professional school opportunity in medical, veterinary, or law school, they are not one of the major support programs in Ph.D. training.

In conclusion I would like to reiterate the major sources of support for predoctoral Ph.D. education in the biomedical and life sciences. The primary source of funding is the research assistantship, which provides support for approximately 30 percent of life science students. The teaching assistantship is nearly as important, supporting 20 to 35 percent of students, depending on the type of school and the specific field. The NIH predoctoral research traineeships support 15 percent of life science/behavioral science Ph.D. candidates, as well as a small cadre of M.D./Ph.D. students. The results of this federal training investment have been excellent and amply justify continued federal investment in this successful program. Other support mechanisms include the National Science Foundation fellowships for 5 percent of students, targeted federal fellowship programs for areas of national need or to encourage minority students, institution-based fellowships, and industry support of graduate students in specific new areas of science. Two large student support mechanisms that are used extensively by undergraduates and professional schools, but which are <u>not</u> a significant source of support for predoctoral science training for Ph.D.s are the work-study program and various loan programs. The choice of support mechanism is influenced by the structure and format of the training program. At the same time the specific field, the type of institution, and the reputation of the institution and its professors help to determine which type of training support will be utilized. Together, this mix of support mechanisms provides the variety and flexibility necessary

for Ph.D. training in the biomedical sciences. The federal role in support of research training in the biomedical sciences is crucial, with one half of all support coming from federal training or research grants. This federal contribution must be sustained to continue our national preeminence in these fields.

Support for Graduate Doctoral Education: Postdoctoral Ph.D. Education

Frank G. Standaert, M.D.

The training of Ph.D. postdoctorals is the most amorphous part of the system that prepares people for research careers in the biologic sciences. Naturally, one cannot ignore the forces that shape the predoctoral programs because whatever affects the predoctoral program eventually will affect the postdoctoral program. It is important to note, however, that predoctoral candidates are almost always in a structured program within a university, and are bound by course and laboratory requirements. Once the degree is obtained, a Ph.D. is much less constrained, having available a wide choice of career opportunity and training both within and outside the university. The system for postdoctoral training, if indeed it is a system, is very broad, very individualized, and very difficult to summarize. For example, it is not possible to state how many postdoctorals there are in the United States. The reason for this is simple. We know who begins as a postdoctoral trainee because anyone who gets a doctorate degree automatically becomes a potential postdoctoral trainee. Unfortunately we do not know how many end the postdoctoral period because there is no time that clearly marks an ending. Without knowing how many exit the postdoctoral period, the size of the pool can only be estimated.

In the minds of many people, the postdoctoral period is a well-defined training position of fixed duration, from two to four years, following which the individual moves on to another job; i.e., it is a time when the scientist is in an apprenticeship and is preparing for an independent career in research. That is not really what happens. A substantial number of people stay in a quasi-postdoctoral position until they eventually stop calling themselves postdoctorals and use titles like research associate or senior technician. In

a very real sense the end of the postdoctoral period occurs when an individual says so. There is no sharp dividing line between when an individual is in a postdoctoral position and when he is in a permanent career position. This discussion will include data sets that have been compiled from a variety of organizations including the National Research Council, NIH, ADAMHA, and the National Science Foundation. Unfortunately, these data sets are not exactly comparable because the definitions of the various categories change from one organization to the next. What is more important than the precise numbers are the trends that are occurring. These general trends are apparent even though the numbers may vary by 10 or 20 percent in different studies.

All of this unpredictable, uncategorizable postdoctoral activity is appropriate for individuals who are becoming independent investigators, because exactly how one achieves this independent status varies with each individual's desires and needs and with the available opportunities. Most observers consider this early postdoctoral period to be very important in shaping the professional life of the future scientist as well as the entire American research enterprise. For the individual the postdoctoral period provides more freedom than he or she probably ever had before or will ever have again. The postdoctoral trainee usually works on someone else's grant, so he has all the freedom of not having to write grant requests or progress reports. He has completed the student period so there are none of the student requirements that we impose on doctoral candidates. He is usually better off financially, though the system does not pay postdoctorals very well. Each is usually working for a well-known institution or person from whom he learns a lot and gains reputation by association. A postdoctoral trainee also has the all important commodity -- time. For once in his life he can immerse himself in science. He knows how to do it, and has the time and opportunity and someone else's money

with which to do it. And finally, because the postdoctoral trainee has no reputation to defend, he can afford to take a chance. He can try ideas that more senior people would shy away from and has the freedom to do things he wants to do that may not work. So he has time, he has freedom, he has ample opportunity to train, and in fact it is a very good time in a young scientist's life.

In addition to the benefits for individuals themselves, the research system depends heavily on these people. Without postdoctorals the American research effort would be very different. Individuals in postdoctoral training are intelligent, well-trained, and highly motivated to do research. Furthermore, most of them are young, physically as well as intellectually vigorous and retain the curiosity and inquisitiveness of youth. They probe into areas that minds already set into molds do not even consider. The challenging work they undertake and their interaction with the faculty have an invigorating influence on the entire laboratory. They are ambitious, publish regularly, and attend meetings. Perhaps most importantly for the system, they leave their postdoctoral positions after only a few years, so turnover is rapid and an active laboratory can count on a constant stream of fresh young minds and new talents to pursue research vigorously and to publish it rapidly. It is a self-feeding system with the more renowned research groups attracting more postdoctoral trainees. The greater the number of postdoctorals, the more exciting the atmosphere and the greater the productivity of the laboratory. This aids the progress of the individual trainee and advances the whole research enterprise. In many ways, our modern American research system of research by interdisciplinary teams with multiple collaborators and authors is really based on the postdoctoral trainee. Without the constant influx of new

intelligence, new techniques, and new ideas, much of the work that is going on would stagnate.

Who are the postdoctoral trainees? According to the statistics that are available, in 1983 there were about 5,500 life science Ph.D. graduates. The life sciences include biological, health, and agricultural scientists. Of these, about 80 percent were U.S. citizens and about 20 percent were citizens of another country at the time they received their degree. About one-third of the foreign students had permanent resident visas and the others had student visas. Of the U.S. citizens, about half planned to do postdoctoral training and about half to go directly into employment. This statistic is something of a surprise because many in academia automatically assume that almost all new Ph.D.s will take postdoctoral training. About 48 percent of those who seek employment will go into research and development, usually in industry, and about 28 percent will go into teaching, largely in undergraduate courses or specialized professional schools like pharmacy. Therefore, in examining post Ph.D. education, we are dealing with the specialized half of the pool of graduates that seeks this type of research training experience.

Table 1 illustrates the changes in post-graduation plans over time. In 1970, only 40 percent of graduates sought postdoctoral study; 32 percent had definite plans, and 8 percent were looking for a spot. By 1983, this had risen so that 60 percent of the graduates were planning to do postdoctoral study. More and more graduates in the biomedical sciences are moving into postdoctoral training and, conversely, there are fewer people seeking employment directly after receiving the Ph.D. degree. Of those seeking employment, fifteen years ago nearly two-thirds were looking at academic positions. Today only one-third will seek an academic job without postdoctoral training. The difference is that today academic departments expect postdoctoral work before they will

offer a position. Because of this expectation, a larger percentage of graduates are looking for postdoctoral training and there are more postdoctoral training opportunities.

Table 1

PLANS OF PH.D. STUDENTS FOLLOWING GRADUATION 1970, 1975, 1980, 1983

Student Plans	1970	1975	1980	1983
Postdoctoral study				
seeking a position	8%	10%	12%	12%
definite plans	32	41	48	48
Employment				
seeking a position	12	12	10	12
definite plans in:	43	30	25	24
academe	31	18	14	13
industry	5	4	5	5
government	5	6	4	4

Source: National Research Council, Office of Scientific and Engineering Personnel, Doctorate Records File

Two very interesting trends in basic biosciences manpower are shown in Figure 1. After rising steadily for over a decade, the number of bioscience Ph.D.s awarded plateaued in 1972. Since then, the number of bioscience Ph.D.s awarded nationally has been essentially stable at 3,500 per year. The number of bioscience postdoctoral appointments shows a striking, continuous rise in the last decade, despite the fact that Ph.D. output has been unvarying. While one might expect a lag time of three to four years between the number of postdoctorals and the number of new Ph.D.s, Figure 1 indicates a much longer lag time. The data suggest that Ph.D.s who graduated some years ago are staying

in postdoctoral positions longer or that more new graduates are finding postdoctoral work, or both. This observation that the postdoctoral pool is expanding has stimulated a concern that we have created a large pool of underemployed highly qualified scientists who should be able to leave the postdoctoral pool, but are unable to find a job because of economic stringencies. I think there are a number of other trends contributing to the increased number of postdoctorals. One is that we expect more postdoctoral training. In the 1940's, postdoctoral training was not required of a new faculty applicant. As science became more complex, the training expectations rose. Now one expects two to three years of postdoctoral training for faculty applicants as well as for scientists for a number of other positions. A second factor contributing to the increased number of postdoctorals is that some people never leave the postdoctoral pool. They stay on to function as supertechnicians, instrument specialists, and research managers, but are counted as holding postdoctoral positions until they change their job title. We have trained a fair number of people who are not really independent investigators, but who are essential to the team concept, large-scale research that we are doing today. Despite these forces contributing towards expansion of the postdoctoral pool, there is evidence that suggests this growth may be leveling off or even reversing. Figure 1 illustrates a slight decline in the number of postdoctorals beginning in 1982.

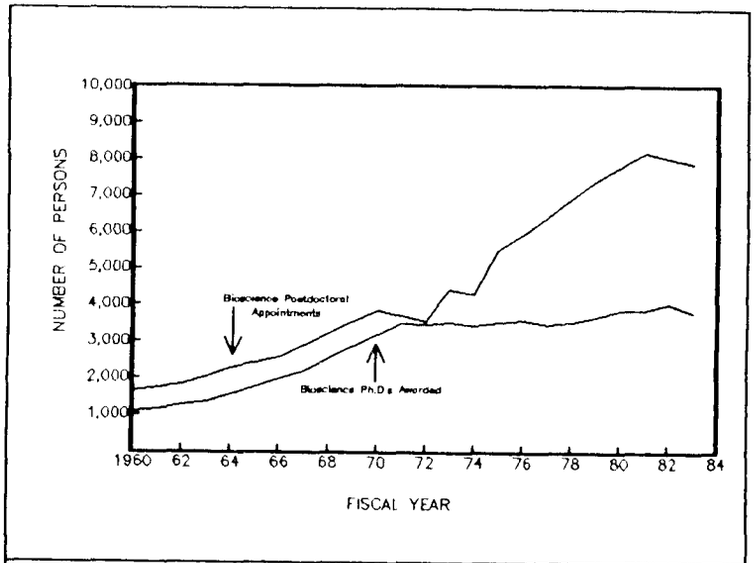


Figure 1: While the number of bioscience Ph.D.s awarded yearly has been stable since 1972, the size of the postdoctoral pool steadily increased until 1982

Source: Data from the 1983 Institute of Medicine "Report on the Personnel Needs and Training for Biomedical and Behavioral Research", Appendix Table B3, page 177

Examination of the specialties represented in the postdoctoral pool reveals that they do not contribute uniformly to the increase observed in Figure 1. Table 2 shows that five specialties have had a 48 percent increase in the number of postdoctoral positions between 1979 and 1983. These five specialties account for much of the increase in the entire pool. The majority of the basic sciences have not increased their numbers of postdoctorals. The five specialties that have grown encompass the new fields of molecular engineering, bacterial genetics, genetics and cell biology, where one would expect retraining or extended specialized training to occur.

Table 2

NUMBER OF BIOSCIENCE POSTDOCTORALS WITH SELECTED SPECIALTY AREAS 1979 AND 1983

Ph.D. Bioscience Specialty Area	Number of Postdoctorals 1979	1983	% Increase
Selected Specialties	1,716	2,534	48%
Biophysics	101	184	
Botany	163	369	
Cell Biology	352	620	
Genetics	239	344	
Microbiology	861	1,017	
All other bioscience postdoctorals	5,175	5,883	13%
Total bioscience postdoctorals	6,891	8,417	22%

Source: National Science Foundation, Division of Science Resource Studies

In examining the sources of support for postdoctorals, for U.S. citizens only, the National Research Council found that 32 percent receive federal traineeships or fellowships specifically designed to support a period of training for the individual. Non-federal sources of support for postdoctoral training account for about 22 percent of positions and are from funds generated by a variety of industries and foundations. Most striking, at least 47 percent of postdoctorals are supported by research grants. These postdoctorals are hired as employees, although they are receiving training at the same time. There are two advantages to the use of research grants to support postdoctoral training. One is that people are being trained in those areas that are considered important research areas by peer review groups. The second advantage is that training tends to occur in the top institutions that are the most productive and research intensive. There is a disadvantage, however, in that

this tends to be a self-perpetuating system, with training occurring in the branches of science that are the most active today.

The salaries and stipends for postdoctorals are not lucrative. The new NIH/ADAMHA postdoctoral fellowship scale ranges from $16,000 in year 1 to $23,000 in year 3 to $30,000 in year 7. The big jump after year 2 coincides with the end of housestaff training and is designed to provide the M.D. research trainee with a stipend from an NIH postdoctoral grant comparable to the one a resident gets as salary. In comparison to the lowest paid medical school assistant professors, whose salary scale begins in the upper twenties, a postdoctoral salary is much less. In fact, a postdoctoral candidate works for less than many other people. For instance, at Georgetown University a newly graduated bachelor, with a B.S. in chemistry or biology and with no special skills, can be hired as a technician for only $500 less than a Ph.D. with six more years of education and experience. A little thought reveals that the new minted Ph.D. is a great bargain and is one reason why there are so many postdoctorals on grants. It is far better to have a postdoctoral working on your grant than it is to have a technician because the postdoctoral is better trained, does more and better work, works weekends, and, best of all, can write. The one question is whether this is exploitation. The idea is to give training in return for work, which is good, but someone who is in a postdoctoral too long becomes a very poorly paid skilled employee, not a postdoctoral trainee.

Once a Ph.D. has completed the postdoctoral period, where does he or she go? Academic positions are one of the major job resources for Ph.D.s with postdoctoral training. Figure 2 illustrates the steady and sharp rise in the number of Ph.D.s employed in the biomedical sciences in colleges and universities, including medical schools, between 1960 and 1983. Figure 3 illustrates some

of the changes that are occurring in the academic labor force. From 1973-1981 the number of postdoctoral employees rose sharply. This rise was paralleled by an increase in all academic ranks through 1978. The continued parallel increase for associate professors and professors suggests that associate professors will become professors in due time. Of interest and concern is the declining assistant professor pool, which suggests that entry level positions are decreasing.

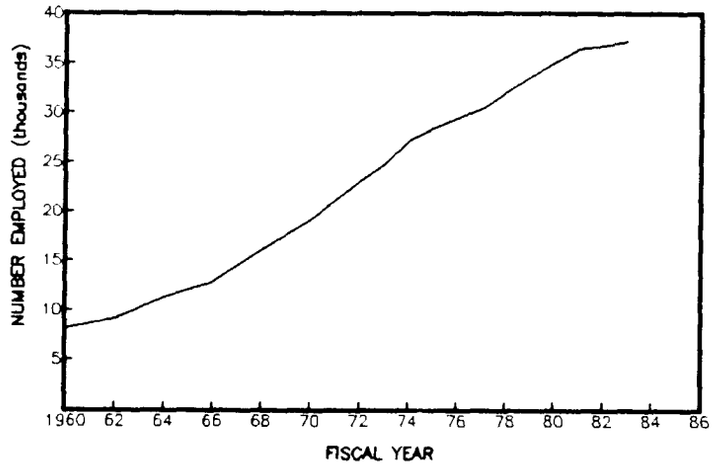


Figure 2: Depicts the number of Ph.D.s employed in the biomedical sciences at colleges and universities, 1960 - 1983

Source: Adapted from the 1983 Institute of Medicine "Report on the Personnel Needs and Training for Biomedical and Behavioral Research", Figure 3.8, page 73

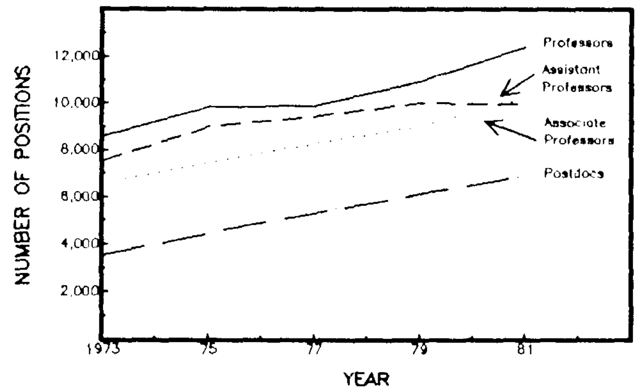


Figure 3: Illustrates the changing employment patterns of Ph.D.s in the academic labor force. The parallel rise in number of Ph.D.s in each academic job category is uniform except for the assistant professor category, suggesting a decrease in medical-school entry level positions

Source: National Research Council, from the 1973-81 Surveys of Doctorate Recipients

An increasing number of Ph.D.s are being hired in non-faculty, non-permanent positions of various kinds and are not entering the faculty mainstream. Table 3 shows the distribution of basic science and clinical science medical school faculties for 1972 and 1982. While there was an increase in the Ph.D.s in the basic science departments, the striking phenomenon was the increase in the number of Ph.D.s in the clinical science departments. Although this represents more participation of clinical departments in research activities, the situation raises special problems. The medical school clinical science departments are an unnatural environment for a Ph.D. Since he is not a clinician, he will have a career limited to being the head of research within a department rather than one as the head of the department, a different career than he might have anticipated. Such a person can and does get tenure; however, it is unclear how stable the fiscal support for such persons will be. If the clinical funds that are used to support the department's activities are

reduced, the Ph.D.s are vulnerable to being replaced by clinical staff who can maintain the revenue base. It is also important to note in Table 3 the increasing "career age" of M.D.s in the basic sciences; that is, the number of years since the doctorate was obtained. The average career age of the M.D. in basic science is 24 years, which means that there are almost no M.D.s entering basic sciences any longer. In contrast, in the clinical departments the career age of the M.D.s and the Ph.D.s has not changed significantly. These data combine to suggest that the entire medical school research effort is becoming more and more dominated by Ph.D.s in both the clinical and basic science departments.

Table 3

CHANGE IN FULL-TIME FACULTY IN U.S. MEDICAL SCHOOLS BY DEGREE TYPE AND DEPARTMENT, 1972 AND 1982

	1972			1982		
Department	MD	MD/PhD	PhD	MD	MD/PhD	PhD
Basic Science						
Number	752	540	5,059	650	438	6,886
% of Total	11	8	76	8	5	83
Career Age*	19		10	24		13
Clinical						
Number	18,504	1,440	3,496	28,515	1,988	5,868
% of Total	72	6	14	73	5	15
Career Age*	15		9	17		11

** Career age represents the number of years since the doctorate was awarded*

Source: National Academy of Sciences/Institute of Medicine Committee on National Needs for Biomedical and Behavioral Research Personnel

To conclude, I would like to make a few points about the future. Figure 4 shows the number of postdoctoral Ph.D. training positions budgeted by NIH and ADAMHA. The number of postdoctoral positions funded by NIH/ADAMHA has been steady and is projected to remain steady for fiscal 1985 and 1986. If

research grants are cut back, it will probably mean more opportunities for postdoctoral training under the remaining research grants because postdoctorals are a better bargain for the principal investigator than technicians. Thus the number of postdoctoral training positions should remain steady. The job market for Ph.D.s will be better because the faculty is growing older. The attrition rate of senior faculty is running about 1 percent per year, which is very small, but within 5 to 10 years that attrition rate is going to move up to 3 to 4 percent, at which point the system will be in balance and will stop growing. Then it becomes a question of maintaining a steady input. If the input declines, the job opportunities should expand. There are a number of indications that the input is going to decline. One is that the support for predoctoral training by the federal agencies has declined and is threatened with even further cuts, reducing the incentive for college graduates to go into predoctoral training. The second indication is depicted in Figure 5. The number of individuals receiving doctoral degrees has been steady, but as a fraction of the population it has been dropping. Clearly we are not producing the same proportion of highly trained scientists among our population as we did ten years ago.

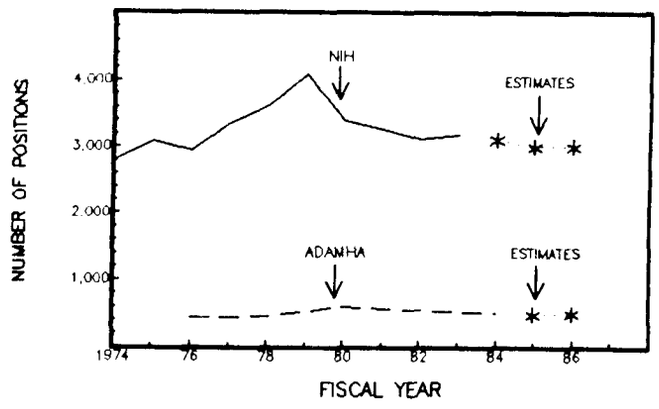


Figure 4: The number of budgeted postdoctoral Ph.D. training positions funded by ADAMHA and NIH. These are FTE positions not numbers of people which may be somewhat larger. Data for 1985 and 1986 are projected.

Source: National Institutes of Health and Alcohol, Drug Abuse, and Mental Health Administration, February 1985.

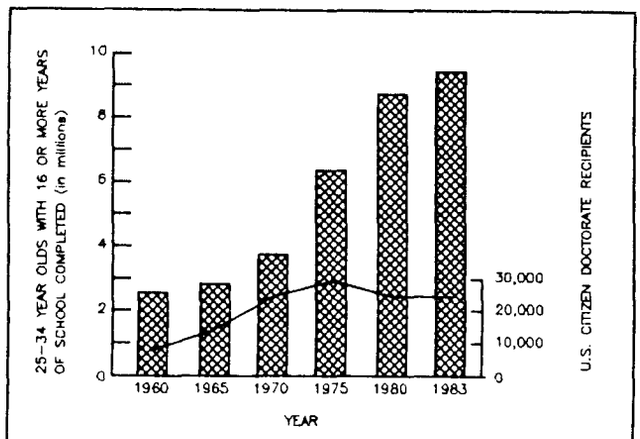


Figure 5: The decreasing number of doctoral awards as a fraction of the potential population. The bars represent the cohort of the U.S. population which is 25 – 34 years old with 16 or more years of school, in selected years from 1960 to 1983. The curve depicts the new Ph.D. recipients in each of the six years.

Source: National Research Council, Office of Science and Engineering Personnel, Doctorate Records File and U.S. Department of Labor, Bureau of the Census

Baccalaureate degrees awarded in this country from 1962 to 1982 are shown in Figure 6 and reveal a very worrisome trend. The number of B.A.s awarded yearly has been steady since 1976, despite the fact that the "baby boom" generation had passed age 21 by 1975. This stable output of B.A.s can be attributed to the enrollment of a larger percentage of a smaller age cohort in college, which is reassuring. However, within the pool of baccalaureate recipients, the number of bioscience bachelor's degrees has fallen precipitously. This is the pool of future bioscience Ph.D.s. There were some 37,000 bachelors degrees awarded in the biosciences in 1984. There were also the same number who took the medical school or dental school aptitude test. It appears that very few of the bioscience B.A. graduates wish to seek straight Ph.D. training; thus the number of those matriculating in Ph.D. programs has dropped very drastically. Because of this decline in the pool feeding the doctoral programs, the number of postdoctoral trainees will eventually decrease, even as the positions for postdoctoral training increase, in both the traditional and the new bioscience fields. My estimate is that by 1990 or 1995 there will be many job opportunities for Ph.D.s as new fields develop and many of us leave the fray to the younger people.

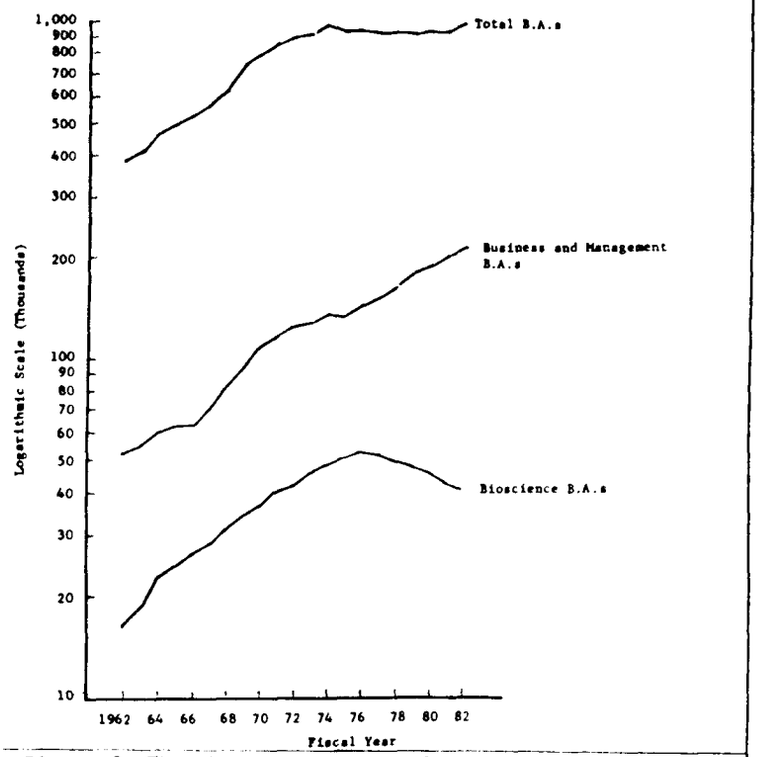


Figure 6: The changing pattern of baccalaureate degrees awarded from 1962-1982 in 2 disciplines. While total BAs awarded here have not increased since 1976, the share of those awarded in the biosciences has declined.

Source: National Academy of Sciences/Institute of Medicine Committee on National Needs for Biomedical and Behavioral Research Personnel

Thus there have been substantial changes in Ph.D. postdoctoral education in the past few years, and there will continue to be changes in both the training and employment opportunities for Ph.D.s in the biologic sciences in the years ahead. Both the interest in and the opportunities for postdoctoral training are increasing. About half of new Ph.D.s take a postdoctoral position, and this number is increasing as employment opportunities change. The size of the postdoctoral pool is growing because of many factors, including economic stringencies, the complexity of science, participation in large-scale research teams, and an increase in specialized training in new fields of research exploration. Postdoctorals are supported by modest stipends from research

grants (47 percent), federal traineeships (32 percent), and non-federal fellowships (22 percent), for two to three years. Following postdoctoral training, an inceasing number of bioscience Ph.D.s are finding employment in colleges, universities, and medical schools, but not as regular faculty appointees. The increased number of Ph.D.s in clinical departments in medical schools is a new phenomenon and may lead to problems in future career development and economic instability in a changing fiscal atmosphere. However, because of the decline in the numbers of new bioscience Ph.D.s and decreasing interest in bioscience at the baccalaureate level, we must begin to be concerned about possible shortages in trained bioscientists in the future. Certainly the training and employment opportunities should be ample in the mid-1990s when the 1985 Ph.D. candidate entrants complete their doctoral education.

The Clinical Subspecialty Training of Physician Investigators

Harold J. Fallon, M.D.

Physicians who aspire to a research career must be properly trained not only in research but in the clinical component of their specialty discipline. The vast majority of these clinical investigators will seek a career in academic medicine and participate in teaching and patient care activities in their fields of expertise in synergy with their research work. To achieve the clinical expertise necessary to fulfill this role for most disciplines requires a minimum of five years of training after receipt of the M.D. degree. In the surgical disciplines primary board certification is not awarded until a trainee has completed a minimum of five years of postgraduate work in an approved residency. Usually the first two years are in general surgery and the remaining three or more are in either general or a specialty surgical discipline such as urology or orthopedics. In the non-surgical disciplines, the practice has arisen of awarding a primary board certification after the completion of three years of training. Such Board certified physicians may then enter practice in internal medicine, pediatrics, or family medicine as primary care physicians. However, future research faculty require additional clinical subspecialty training in fields such as nephrology or rheumatology to attain the level of specialty clinical competence necessary to their academic and research roles, and commonly will undertake a two- to four-year fellowship, during which subspecialty clinical and research training are both provided.

This paper will examine the sources of support for this clinical subspecialty component of graduate medical education. There is a paucity of information on fellowship support, with most of the available data derived from studies of manpower in the field of internal medicine. However, this subset of subspecialty fellows or residents is well worth examining since it is estimated that at least two-thirds of all clinical fellows are in the subspecialty fields of internal medicine. Accreditation Council on Graduate Medical Education (ACGME) statistics show that subspecialty board certification was awarded to over 31,000 individuals between 1974-1984; of these, 69 percent were subspecialty internists. In reviewing the available data on clinical subspecialty fellows in internal medicine, we will refer to the entire group of fellows; we do not have an accurate estimate of how many of these fellows enter academic positions and how many enter specialty practice in medicine.

I am indebted to several sources for the manpower data in this paper; they include Gerald S. Levey, M.D., chairman of medicine, University of Pittsburgh who has directed the National Study of Internal Medicine Manpower (NSIMM) for the last three years, Lynn Langdon of the American Board of Internal Medicine, Lynn Morrison of the Professors of Medicine, and Dick Nelson of the ACGME.

In internal medicine, all of the recognized subspecialties except general internal medicine currently require board certification. Table 1 lists the NASIMM data on the total number of internal medicine subspecialty fellows in 1983-84 by discipline. Note that there are twice as many cardiology fellows

as in any other program; nearly one-quarter of all 7,025 fellows are in cardiology training. The large number of subspecialty fellows in internal medicine includes a substantial number of trainees who graduated from foreign medical schools. As shown in Table 2, presently 16 percent of fellows are foreign graduates of foreign medical schools and 4 percent are U.S. citizen graduates of foreign medical schools. Table 3 depicts those who completed subspecialty training and passed the certifying Board examination in the most recent two-year cycle ending in 1983. The total number of trainees who were foreign medical graduates (FMG) ranged from over 30 percent in nephrology and cardiology to about 15 percent in rheumatology and infectious diseases. Pass rates on the examination ranged from over 80 percent in the latter disciplines to 67 percent in cardiology. Clearly a large number of FMGs are in training for the U.S. subspecialty boards.

Table 1

FELLOWSHIP TRAINING BY FIELD IN INTERNAL MEDICINE 1983-84

Subspecialty	F1*	F2*	F3*	Total Fellows	#Programs
Allergy/immunology	68	62	19	149	47
Cardiology	774	731	230	1735	251
Critical care	78	28	0	106	29
Endocrinology	214	161	63	438	132
Gastroenterology	386	368	61	815	185
General internal medicine	83	50	37	170	24
Geriatrics	65	37	6	108	28
Hematology	66	40	17	123	41
Hematology/oncology	283	223	146	652	125
Infectious disease	222	197	68	487	130
Nephrology	262	247	65	574	141
Nutrition	17	11	5	33	13
Oncology	158	144	47	349	49
Pharmacology	46	35	6	87	33
Pulmonary disease	349	337	92	778	174
Rheumatology	194	182	45	421	116
Total	3,265	2,853	907	7,025	1,518

** F1, F2, and F3 refer to year of fellowship*

Source: Adapted from Schleiter, MK and Tarlov, AR. National Study of Internal Medicine Manpower IX. Internal Medicine Residency and Fellowship Training: 1984 Update. Ann Intern Med; 102:681-685.

Table 2

COMPOSITION OF CLASSES IN INTERNAL MEDICINE FELLOWSHIP TRAINING ACCORDING TO MEDICAL SCHOOL ATTENDED 1982-83 AND 1983-84

Type of Graduate*	Year of Fellowship F1	F2	F3	Total+ Number	Percent
1982-83					
USMG	2,464	2,095	569	5,128	79
US-FMG	108	78	15	201	3
FMG	565	453	129	1,147	18
Total	3,137	2,626	713	6,476	
1983-84					
USMG	2,608	2,272	742	5,622	80
US-FMG	124	128	18	270	4
FMG	533	453	147	1,133	16
Total	3,265	2,853	907	7,025	

** USMG = graduates of U.S. or Canadian medical schools; US-FMG = U.S. Citizens who graduated from foreign medical schools; and FMG = foreign graduates of foreign medical schools.*

+ 1,455 fellowship programs were surveyed in 1982-83 and 1,518 in 1983-84

Source: Adapted from Schleiter MK and Tarlov AR. National Study of Internal Medicine Manpower IX. Internal Medicine Residency and Fellowship Training: 1984 Update. Ann Intern Med; 102:681-685.

Table 3

CERTIFICATES AWARDED BY INTERNAL MEDICINE SUBSPECIALTY BOARDS FOR THE TWO-YEAR CYCLE ENDING IN 1983

Subspecialty	#Certificates	Total Number Trainees % Pass	% FMG
Cardiology	1825	67%	33%
Endocrinology	353	70	29
Gastroenterology	865	79	27
Oncology	750	72	22
Hematology	400	66	29
Infectious Disease	370	82	14
Nephrology	568	68	36
Pulmonary	947	69	26
Rheumatology	421	81	15

Source: American Board of Internal Medicine

What are the sources of support for these subspecialty fellowship programs? Nationwide, for clinical fellows in all the medical disciplines, the estimated sources of support for stipends and benefits for trainees in 1982-83, based on a survey of AAMC Council of Teaching Hospitals members, are shown in Figure 1. For internal medicine alone, the sources of support are given in Table 4. In the case of internal medicine, while general hospital revenues support over 70 percent of the stipends for internal medicine residents during their first three years of primary board training, only 39 percent of the stipends for clinical fellows came from this source in 1983-84. The VA and military hospitals were the second largest source of funding, providing 20 percent of total funds. Federal training grants, which provide laboratory or clinical research training for at least some of those destined for academic positions, provide only 11 percent of support for clinical fellows overall. This share of support is decreased from the 15.1 percent grant support of fellows available in 1976-77. Since these training grants are limited to support of the research component of training only, even those fellows who will enter academic research must be supported for the clinical subspecialty portion of their fellowship years by other sources of funds. Other sources of funding for fellows contribute only small percentages to the total support available nationwide. Faculty professional fees account for only 8 percent of support and private foundation grant only 6 percent. Clearly the major source of funding for these trainees, who care for patients as a major component of their activities, remains patient care revenues. In Table 4, based on estimates from chairmen of departments of medicine, the total expenditure for subspecialty training in internal medicine in 1983-84 was $165 million. Using these data we could make some extrapolations as to the total cost of subspecialty training. If internal medicine fellows are two-thirds of the total as we estimated

earlier, then the total cost for subspecialty trainee stipends in 1983-84 in all disciplines might be estimated at almost $250 million.

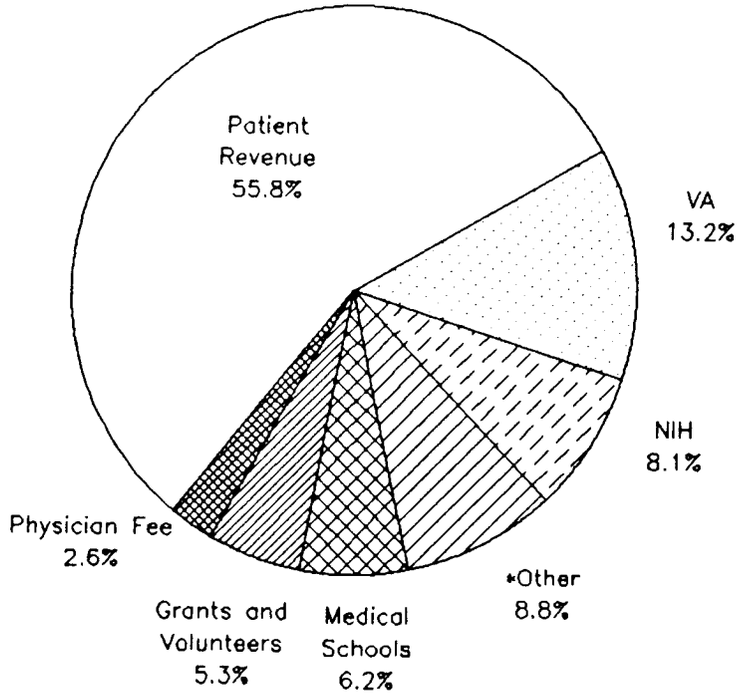


Figure 1: Nationwide sources of funding for clinical fellows stipends and benefits; 1982-1983.

** Includes state and municipal appropriations, federal agencies and endowments*

Source: COTH Survey of Housestaff Stipends, Benefits and Funding, 1983. Association of American Medical Colleges, Department of Teaching Hospitals.

Table 4

SOURCES OF FELLOWSHIP STIPENDS IN INTERNAL MEDICINE 1976–77 and 1983–84

Sources	1976–1977 · Percent	1976–1977 · Dollars*	Converted to+ 1983 Dollars*	1983–1984 · Percent	1983–1984 · Dollars*
Hospital revenue	33.0	29,666	51,916	39.0	64,552
State and local government	5.0	4,495	7,866	6.0	9,931
VA and military	20.8	18,698	32,722	20.0	33,104
Federal training grants	15.1	13,574	22,754	11.0	18,207
Research grants	5.1	4,585	8,023	3.0	4,966
Professional fees	6.6	5,933	10,382	8.0	13,242
Medical school funds	4.6	4,135	7,236	4.0	6,621
Foundation training grants	5.7	5,124	8,967	6.0	9,931
Other	4.1	3,686	6,450	3.0	4,966
Total		89,896	157,318		165,519
Mean stipend/program		59	105		109
Mean stipend/fellow		15	27		24

* *Dollar amounts given in thousands, excluding fringe benefits.*

\+ *Calculated from the change in annual consumer price indexes between 1976 and 1983.*

. *Data for 1976–77 from Tarlov and colleagues and based on results of a survey of 1512 programs with 5,885 fellows. For 1983–84, 1518 programs with 7,025 fellows were surveyed.*

Source: Adapted from Schleiter MK and Tarlov AR. National Study of Internal Medicine Manpower IX. Internal Medicine Residency and Fellowship Training: 1984 Update. Ann Intern Med; 102:681–685.

Table 5 lists each of the subspecialties in internal medicine and their particular source of revenue. Within internal medicine there are nine subspecialty boards. Neither general internal medicine nor geriatrics have subspecialty boards, but there are subspecialty training programs in these areas. There is a dramatic variability in funding sources from one subspecialty to another that would be hidden by only examining overall trends. For example, hospital revenues support training in cardiology and critical care in much greater proportion than they provide stipend support for training in geriatrics or endocrinology. Some subspecialties have an unusual distribution of funding source, such as geriatric training, where the VA provides more than half of the total funding for geriatric fellowships. The foundations tend to support non-traditional areas, such as general medicine, pharmacology and geriatrics. Federal training grants contribute substantially to support of fellows in some disciplines, particularly endocrinology and pharmacology. Clearly, subspecialty training is not a monolithic entity. The amount spent on training in 1983-84 varied from a high of $41 million in cardiology to a low of $0.7 million in nutrition.

Table 5

SOURCES OF FINANCING OF FELLOWSHIP STIPENDS BY SUBSPECIALTY IN INTERNAL MEDICINE

Subspecialty	Hospital Revenue	State & Local Government	VA & Military	Federal Training Grants	Research Grants	Professional Fees	Medical School Funds	Foundation Training Grants	Other	Dollar Amount*
Allergy/immunology	32%	24%	19%	7%	3%	5%	2%	6%	3%	$ 3,627
Cardiology	48	4	16	5	2	12	4	3	5	41,125
Critical care	75	0	7	0	2	6	2	6	1	3,383
Endocrinology	25	4	21	29	3	4	6	4	3	10,107
Gastroenterology	40	7	23	11	2	7	4	3	2	18,160
General internal medicine	47	7	5	4	0	4	5	26	2	3,928
Geriatrics	12	2	55	4	0	8	4	16	0	3,573
Hematology	45	12	8	15	0	6	1	13	0	2,935
Hematology/oncology	32	2	26	20	5	6	5	3	2	15,788
Infectious disease	36	5	23	13	7	2	4	6	5	11,166
Nephrology	43	3	18	11	2	10	4	5	2	13,315
Nutrition	34	7	13	24	0	10	9	4	0	709
Oncology	19	29	8	11	5	12	3	10	3	7,924
Pharmacology	5	3	8	29	10	0	6	32	8	1,999
Pulmonary disease	42	4	22	11	2	5	3	8	2	18,105
Rheumatology	37	5	19	13	3	3	5	12	3	9,608

* *Dollar amount given in thousands excluding fringe benefits.*

Source: Adapted from Schleiter, MK and Tarlov AR. National Study of Internal Medicine Manpower IX. Internal Medicine Residency and Fellowship Training: 1984 Update. Ann Intern Med; 102:681–685.

One of the biggest current concerns in internal medicine manpower projections is the large number of subspecialists being produced. The GEMENAC report has estimated that there will be excess numbers of practicing physicians in almost all of the medical subspecialties by 1990. This is true for some of the surgical specialty disciplines as well. Of interest, is the decline in the percent of all internists who pursue subspecialty training from a high of 75 percent in 1976 to around 60 percent in the last two to three years. This trend has paralleled a trend for the increasing numbers of women entering internal medicine to choose general internal medicine; whereas male trainees more frequently pursue further subspecialty training.

The trends toward participation of FMGs in clinical subspecialty training are also important to note. Almost 85 percent of alien FMGs completing an American internal medicine residency enter subspecialty training, while for U.S. graduates the total is 63 percent. U.S. FMGs have the lowest rate of subspecialization after general medicine residency at 23.4 percent. These figures are contrary to the conventional wisdom. The factors that lead FMGs to seek subspecialty training, such as personal career goals, U.S. hospital placement, or other factors are still undetermined. We do know that to participate in a subspecialty training program leading to board certification in the United States, one must have trained in a domestic internal medicine residency program so this group does not represent an influx of further foreign graduates using fellowships as a point of entry into the system. Nonetheless, the interest of FMGs in subspecialty training is a fact that has cost implications and political implications if one is beginning to think about ways to reduce the supply of subspecialty manpower.

Overall, while the numbers of subspecialists practicing internal medicine in the U.S. will remain high, the numbers of generalists is increasing and the

percent of subspecialists is expected to gradually decline. Whether this trend is a reflection of the greater numbers of women entering medicine, is due to a restriction on the number of subspecialty training positions, or is a response to a general awareness of the GEMENAC predictions of oversupply is not known.

Another trend of importance in estimating the total manpower pool is to examine how many first year fellows complete a second year and even a third year of fellowship. Tables 2 and 3 reveal that almost 90 percent of those completing the first year (F1) will complete the F2 year and thereby become subspecialty board eligible. In addition, a substantial number of fellows, almost 32 percent in 1983-84, stayed on for a third year, up from 14 percent in 1977. An increasing number are even electing a fourth year of fellowship. While one might expect that these highly trained subspecialists are the subset who will seek academic positions and begin careers as clinical investigators, there is not a one-to-one correspondence between the numbers of these advanced trainees and the numbers entering academic positions in medicine. The demands of subspecialty practice in medicine are increasing so rapidly that many trainees believe that additional years of fellowship experience are necessary prior to entering a practice career as well as a research career. It would be interesting to investigate the career outcomes of these advanced clinical fellows and also to examine the sources of support for these third and fourth year fellowships as contrasted with the present data (Table 4) which mostly reflect funding for the large numbers of trainees in the F1 and F2 years required for specialty board eligibility.

Finally it is important to examine one trend that I think will have an impact on the future distribution of internists between subspecialists and generalists. That influence is the recent action of the Internal Medicine

Residency Review Committees (RRC-IM) to accredit subspecialty training programs. Subspecialty programs have never been accredited in internal medicine, although this has been the practice in surgery. The development of accreditation guidelines has been slow due to the large number of subspecialty programs (1,400 with an average of 2 people per program), the evolution of the various subspecialties, and the process of developing agreement between the nine subspecialty programs and the RRC-IM. The seven major stan-dards that the Residency Review Committee now requires of subspecialty training programs are:

1. Association with an approved general medicine program
2. Adequate faculty and time commitments
3. Adequate patient material for teaching
4. Adequate procedures and facilities
5. Structured curriculum
6. Peer interaction
7. Exposure to research

First, the subspecialty program must be associated with an approved general medicine training program. There are a number of free-standing hematology, oncology, and cardiology programs that do not meet this requirement. Second, there need to be adequate faculty and faculty time commitments. Many programs have been apprenticeship systems and do not meet minimum standards in that area. Third, there needs to be an adequate patient mix for proper teaching in the subspecialty, which is a problem in some hospitals. Fourth, procedures and facilities must be adequate. This requirement has had a big impact because hospitals are no longer doing all the things necessary to sustain an acceptable subspecialty training program. It is also a requirement that approved, accredited subspecialty training programs in internal medicine have

access to clinical or basic research activities. As a result of these subspecialty accreditation requirements the number of internal medicine training slots in subspecialties can be predicted to decrease, although that is not the objective of the certification process which is designed to certify minimum quality standards. If a decrease in subspecialty training positions occurs by this accreditation review, it will further contribute to the desired overall decline in subspecialty manpower in Internal Medicine. Also, current proposals to restrict Medicare funding for graduate medical education to primary board certification would have a drastic impact on the production of medical subspecialists. We must, under these changing circumstances, identify and defend the sources of support for the vital clinical subspecialty component of the training of future academic research physicians as well as replacements for the necessary number of clinical subspecialists. Academic physicians will need subspecialty clinical competence to fulfill their roles as tertiary care physicians in the academic setting and to enable them to identify and pursue those research problems of greatest clinical relevance to their disciplines. While many forces can be predicted to conspire to reduce the proportion of subspecialists in practice, we must be concerned to preserve the resources necessary to train clinical investigators.

Support for Graduate Medical Education

Research Training for Clinicians

Doris H. Merritt, M.D.

One of the major recent concerns of the National Institutes of Health has been the decrease in the percentage of clinicians serving as principal investigators on research grants. In fiscal 1972 31.3 percent of new research project grants (ROls) were awarded to first-time applicants with clinical degrees. Of these 6.4 percent were M.D./Ph.D.s. In fiscal 1982 this total figure dropped to 20.2 percent of whom 5.2 percent were combined M.D./Ph.D degree holders. These figures do not account for clinical investigators receiving support through program project grants and centers. Nonetheless, the ROl represents a critical portion of NIH funding. None of us pretend to know what the ideal percentage of M.D.s in the new ROl applicant pool should be, but we are probably agreed that it should not be zero. The decreasing number of physicians in research training programs through 1980 supports the pessimistic view that M.D.s will continue to decrease as principal investigators for some time. It was because of these trends and the implications of the decrease in trained investigators to conduct future research requiring the special insight of the clinician that Dr. Wyngaarden, in 1978, focused on the "endangered species". Subsequent addresses by the presidents of various academic societies fueled the ensuing national discussion and, thus, the emphasis on research training for clinicians.

This paper will briefly review research training for clinicians, both that provided through the National Research Service Award (NRSA) program, and the more advanced Career Development Series.

A common way to describe the NRSA program is in terms of institutional and individual awards. Table 1 shows the NRSA research training programs supported by each of those mechanisms for predoctoral and postdoctoral levels of training. By statute, the number of NRSA individual awards can account for no less than 15 percent of the yearly NRSA appropriation.

Table 1

NRSA MECHANISMS

	Level of Training	
	Predoctoral	Postdoctoral
Institutional Awards		
Institutional Research Training Grants	X	X
Medical Scientist Training Program	X	
MARC Honors Undergraduate Program	X	
Short-Term Training: Health Professional Schools	X	
Summer Pulmonary and Hypertension Research	X	X
Individual Awards		
Postdoctoral Fellowship		X
Senior Fellowship		X
MARC Predoctoral Fellowship	X	
MARC Faculty Fellowship	X	X
Cancer: Nurse Oncology	X	

As shown in Table 2, there has been a significant shift in the predoctoral portion of the NRSA program since 1977. Special programs such as the Medical Scientist Training Program (MSTP) have come to represent an increasing share of the allotted predoctoral positions.

Table 2

NRSA PROGRAM DISTRIBUTION as a PERCENTAGE OF POSITIONS

	1977	1980	1983
Positions	10,198	10,664	10,570
Predoctoral	44%	37%	36%
Postdoctoral	50%	52%	50%
Special Programs	6%	11%	14%
MARC	(1.3%)	(3.0%)	(4.6%)
MSTP	(4.9%)	(6.2%)	(6.4%)
STT:SHPS		(2.0%)	(2.8%)

Figure 1 depicts the numbers of individuals in the NIH research training program for the ten years since the NRSA legislation was passed and all previous research training authorities abolished. All individuals who received appointments are counted, including those of less than 12 months duration. The number of individuals is, therefore, higher than the actual obligations for full-time training positions generally reflected in budget tables.

Figure 1

INDIVIDUALS IN NIH NRSA RESEARCH TRAINING PROGRAMS, 1974-1983

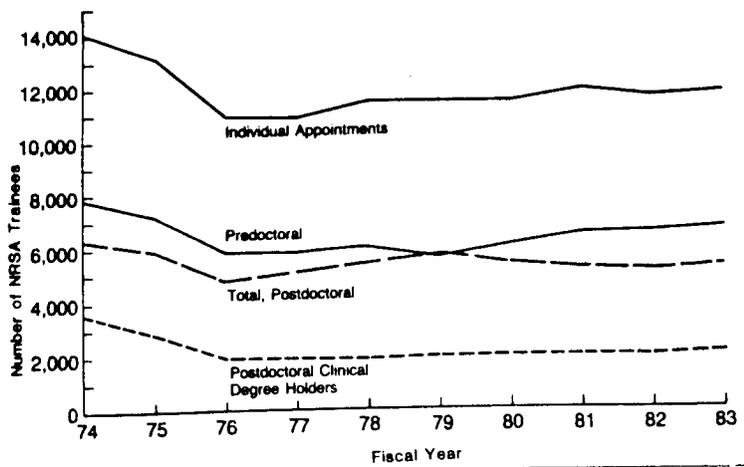


Figure 1: Total NRSA trainees each fiscal year. Initial high point reflects simultaneous existence of 3 training programs: TOIs, Weinburger awards, and new NRSAs.

The large number of individuals supported in 1974 is a result of the release of impounded 1973 funds and the simultaneous existence of three training programs: the old TOIs, the Weinburger awards initiated after the TOI program was abolished, and the newly introduced NRSA awards. By 1976, the TOIs and Weinburger commitments essentially were fulfilled, and from that time on the number of individuals in research training under the NRSA has been remarkably constant. This stability was achieved only through vigilant efforts on the part of many. Each year between 1978 and 1985, the administration sought to cut the NRSA training program, and each year the Congress passed an appropriation for NRSA sufficient to maintain the program at the previous year levels. The fiscal 1986 budget represents the first time in the past eight years that NRSA training has not been an element of contention requiring congressional remediation.

The decline in the numbers of predoctoral trainees, which includes the Minority Access to Research Careers (MARC) program and the Medical Scientist Training Program (MSTP), resulted from the failure of the training appropriation, in 1979 constant dollars, to increase in the face of increasing tuition, and the addition in fiscal 1980 of a new program, Short-Term Training for Students in Health Professional Schools. Approximately 900 students participated in the Short-Term Training program in 1980. The stability of the predoctoral training program is expected to continue in fiscal 1985, with a possible modest decrease in the total number of predoctoral students, reflecting the effect of continuing increases in tuition. However, the loss of some 250 to 300 predoctoral students, while only a three percent drop in the total NRSA program, would represent a decline of almost ten percent in the predoctoral training program.

The total postdoctoral training pool has remained relatively constant since 1976. However, because the number of clinicians in research training had become so small and clinicians continued to disappear from the group of first-time principal investigators, research training for clinicians began to be considered a critical problem in 1978. Figure 2 shows the trends from 1974 to 1983 in the number of clinicians in training programs. The postdoctoral clinical trainees reached a nadir in 1978 and began a very slow rise to 2,113 trainees by 1983. This is approximately the number recommended in the 1983 NAS report on the National Needs for Biomedical and Behavioral Research Personnel. The Medical Scientist Training Program (MSTP) increased its appointments from 451 students in 1974 to 677 in 1983. This six year program is considered one of NIH's most successful in training clinical investigators. Seventy percent of the MSTP graduates hold positions in academic medicine doing research and training other physicians. The program was able to fund 682 students in FY 84 and will fund the same number in FY 85. It will be strengthened to support approximately 725 students per year, as soon as funds permit, at which point it will support more than 100 M.D./Ph.D. graduates per year. These scientists are currently competing most successfully for R01 research grant support. The Short-Term Training for Students in Health Professional Schools is an extremely popular program reintroduced in fiscal 1980 following a change in the NRSA payback obligation. This training program is expected to continue to support approximately 1,200 students a year. NIH estimates that in fiscal 1984 and 1985 the pattern for initial research training of future clinicians will not change appreciably from that shown for 1983.

Figure 2

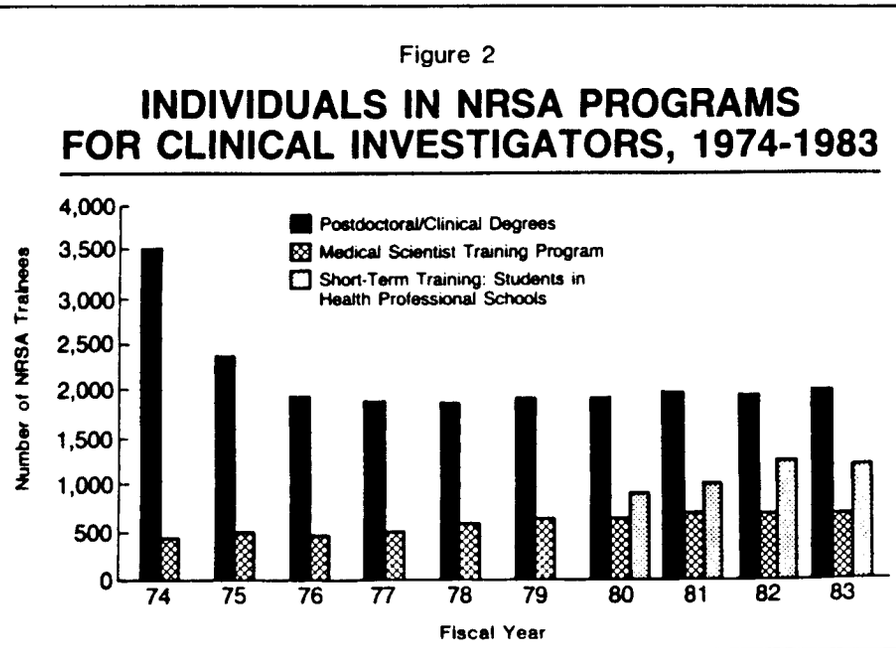


Figure 2: Depicts clinicians in the NRSA postdoctoral training programs.

There have been some new directions in the NRSA program. There is convincing evidence to show that the student who interrupts medical school for a year of research training is likely to elect a research career. Training program directors have been encouraged, with the prior approval of the NIH program administrator, to consider using available stipend money to offer a year of research training to medical, dental or veterinary students; one postdoctoral stipend can support two such trainees at the predoctoral level.

A further NRSA program is being introduced by NIH. The National Health Service Corps program supports medical students with tuition and salary in exchange for a service obligation. This NHSC service obligation can be met by service in research. However, prior to 1981, only those students who received an individual NRSA award could convert their service obligation to a research payback obligation. In 1981, the Congress modified the law to permit research training on an institutional training grant to serve as the bridge from an

NHSC service obligation to a NRSA research obligation. Almost 200 such appointments have since been made to the institutional training programs around the country.

In order to attract NHSC M.D. graduates to NIH for research training, a special intramural NRSA program was begun in fiscal 1985 under the direction of Dr. Edward Rall. Five NIH Institutes -- National Heart, Lung and Blood Institute, National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases, National Institute of Allergy and Infectious Diseases, National Institute of Child Health and Human Development, and the National Institute of Dental Research -- plus the National Institute of Mental Health in ADAMHA are particpating. The program will accept approximately 20 new trainees a year for a three-year enrollment under NRSA rules and regulations. National Health Service Corps students are given first priority for appointment.

The importance of more and better quality training for our future physician-scientists cannot be overemphasized. Recent analyses by the NIH indicate that the more time M.D. postdoctoral trainees spend in training, the more likely they are to apply for and receive an NIH R01 research grant. Our data show that when the length of supported research training is 12 months or less, only 20 percent of such M.D. trainees apply for an R01 grant and 50 percent of these applicants are successful. By contrast, 43 percent of those who received NIH supported research training for 30 months or longer apply for R01 grants and 70 percent of these applicants are successful. In general, M.D. recipients of individual fellowships are more successful than those trained on institutional grants, but this may merely reflect their greater duration of research training. While NIH has only been able to analyze data on R01 grantees and not all M.D. investigtors participating in NIH sponsored research,

this improvement in R01 award rate from 10 percent to 30 percent of former trainees, which is associated with extending the training period beyond 30 months, has led us to conclude that M.D.s have fallen behind in competing for R01s chiefly because of inadequate research training.

As a result of these findings, Dr. Wyngaarden convened a seminar in June 1984 to review the current program guidelines for the NRSA institutional training grant to assure that the mechanism was being used to the best advantage for the research training of physicians. Recommendations from that meeting were promulgated in November 1984. All program directors were advised that NIH is reemphasizing certain elements of the guidelines and in particular would like all research trainees to commit themselves to an initial minimum investment of two years of research training, during which not less than 80 percent of their time is devoted to research. The NIH is particularly interested in eliminating the ambiguity between training for research and finishing subspecialty clinical training, for which many of these grants have been improperly used in the past. In addition, the guidelines stress a stronger basic science component. For those trainees who are initially successful and promising, the NIH recommends an additional two or three years of research training. As a result of these initiatives, the NIH hopes that M.D. trainees will become better prepared to compete for research grants of the R01 type.

The fiscal 1985 appropriation contained a substantial increase of funds for research training, which was earmarked for increased stipends. These increases, as shown in Table 3, were aimed primarily at making the income of the clinical postdoctoral trainee comparable to housestaff salary and thus more attractive to physicians. Equity was maintained for the postdoctoral Ph.D. who, after two years of postdoctoral training, is contributing in an important way to research activity.

Table 3

NRSA POSTDOCTORAL STIPENDS COMPARED WITH HOUSESTAFF SALARIES

Years of Relevant Experience	NRSA Stipend FY 1985	Housestaff Salary 1984-1985
0	$15,996	$20,808
1	17,004	22,202
2	21,996	23,450
3	23,004	24,660
4	24,000	25,847
5	26,004	27,115
6	27,996	
7 or more	30,000	

Predoctoral stipends were also increased, to $6,552 a year. This stipend was not meant to compete with the National Science Foundation stipend of $11,500. The NIH has traditionally looked upon the predoctoral stipend as assistance and not total subsistence. On the other hand, the cost per predoctoral student per educational institution is essentially the same as for NSF because the NIH, at this time, supports full tuition and the NSF contributes only $6,000 to tuition and other training related expenses. Because the increases in tuition over time will diminish the number of predoctoral trainees that can be supported under the NRSA, a group of representative university presidents, deans of graduate schools, and research training program directors were invited to meet at NIH in July 1984. After considerable discussion, these advisors agreed that NIH should utilize for tuition the model in effect for many

years for managing salary increases for research personnel in the successive years of a research grant. That is, NIH will pay an increase of only 6 percent per year over the tuition charged in the original or competing year of the award. Flexibility to rebudget funds will be encouraged by NIH with the assurance that program directors will do everything possible to maintain the maximum number of trainees. The variation in budgeted positions for NIH trainees and fellows and actual dollar obligations for the NRSA program since 1974 is shown in Table 4. While it would appear that NIH has reduced the number of positions in 1985 by 600, the number of full-time positions will eventually exceed this estimate by some three to six percent due to prudent budgeting. For example, the 10,514 trainees shown for 1984 began as an estimate of 9,863.

Table 4

NIH SUPPORTED TRAINEES AND FELLOWS

Year	Dollar Obligations (in thousands)	Full-Time Training Positions	
1974	$186,489	13,341	Impoundment Release NRSA Act
1975	154,875	12,272	Stipend Increase
1976	119,998	9,654	
1977	127,458	10,198	
1978	143,926	11,123	
1979	143,661	11,197	
1980	176,388	10,664	Stipend Increase
1981	175,172	10,695	
1982	150,474	10,406	Allowance Cut
1983	164,654	10,570	Stipend Increase
1984	166,462	10,514	
1985*	217,943	9,891	Stipend Increase
1986*	217,943	9,891	

* Estimate

The current options for advanced research preparation offered by the Research Career Development, or K, series are shown in Table 5. It omits any reference to the Research Career Awards, which were lifetime awards designed to stabilize research faculty positions. These were discontinued, except for commitments, in 1964. The oldest of the K series is the Research Career Development Award (RCDA). These are used solely for salary and fringe benefits and were meant originally to follow the postdoctoral fellowship. After one five-year renewal, the RCDA was to be followed by the Research Career Award. Without the Research Career Award option, the RCDA has become less of a development award and is used more for junior faculty support. More than 80 percent of present holders of the Research Career Development Award now have R01 support. All NIH institutes support the RCDA, although some require an active R01 for eligibility.

Table 5

NIH RESEARCH CAREER DEVELOPMENT AWARDS

	NIA	NIAID	NIADDK	NCI	NICHD	NIDR	NIEHS	NEI	NIGMS	NHLBI	NINCDS	DRR	NLM
Research Career Development Award (K04)	X	X	X	X	X	X	X	X	X	X	X	X	X
Academic Investigator Award (K07)	X	X		X						X			
Clinical Investigator Award (K08)	X	X	X	X	X		X			X	X		
Mid-Career Development Award (K07)							X						
Special Emphasis Research Career Award (K01)	X											X	
Dental Scientist Award (K15)						X							
Physician Scientist Award (K11)	X	X	X		X	X	X	X		X			

The rest of these awards have two elements in common. They provide a salary of up to $40,000 plus applicable fringe benefits and are available only to

U.S. citizens. The actual salary is to be comparable to that of others at the same institution who are at the same level of training and experience.

All awards are not made by all institutes. Each institute, with advice from its National Advisory Council, selects the mechanisms that best meets its unique mission objectives. Furthermore, the details of the award are institute tailored for targeted results. As a result, the degree of the applicant (M.D. or Ph.D.), the extent of prior experience, the duration of the award, and the provisions for additional research support vary from institute to institute. There is no doubt that the choice of the appropriate award may be both confusing and frustrating for applicants, particularly if what appears to be the most applicable award is not available in a particular scientific area.

The Academic Investigator Award is designed to support the individual's own research career development but carries a strong element of institutional commitment to curriculum development to improve the environment for research. The Clinical Investigator Award is generally meant for those who have completed clinical training and do not want an extensive laboratory experience, although laboratory experience may be supported by this mechanism. Only the National Institute of Environmental Health Sciences designates a Mid-Career Development Award because they are seeking the expertise of individuals from other disciplines. The Special Emphasis Research Career Award is supported by the Division of Research Resources for veterinarians who wish to become laboratory animal scientists and by the National Institute on Aging to develop the capacity for multidisciplinary research in specific areas related to the social and behavioral sciences. The Dental Scientist Award for dentists with a strong commitment to oral health research will be initiated in fiscal 1985. The Physician Scientist Award is designed to provide the awardee with five

years of phased supervised research development with a strong emphasis on basic science experience before undertaking work at a more independent level. As with all other awards in the K series, it is intended to provide support during transitional years until the awardee can establish a personal research program.

The degrees held by individuals in the Research Career Development series are illustrated in Figure 3 for the years 1977, 1980, and 1983. The number of M.D.s is approaching parity with the number of Ph.D.s, especially since the implementation of programs to promote clinical research. The 1984 pattern for the Research Career Development programs will show a slight increase in the number of M.D.s with the introduction of the Physician Scientist Award, which, in its first year was used to support 37 individuals on individual awards and two individuals on each of three institutional awards. The number of M.D. awards can be expected to increase slightly in 1985 as the clinical programs reach full strength. It is the intention of NIH to maintain a 50-50 ratio of M.D.s to Ph.D.s.

Figure 3

NIH RESEARCH CAREER DEVELOPMENT PROGRAMS, 1977-1983

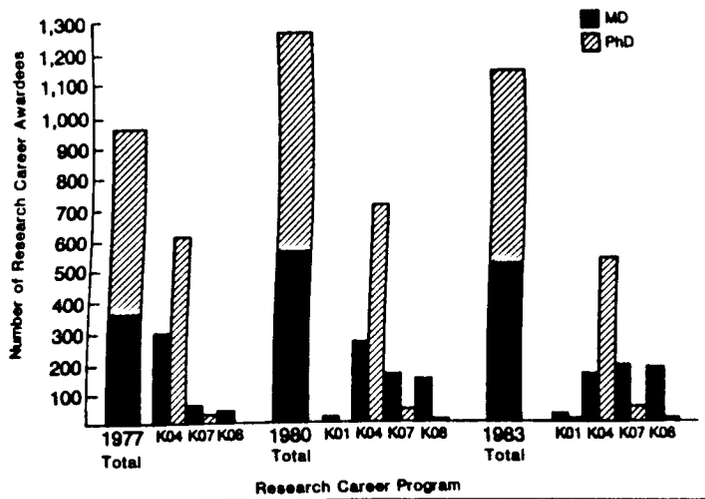


Figure 3: Represents the degrees held by individuals awarded a Research Career Development award. The initial column depicts the total awardees, the following slimmer bars distribution of program awards. See Table 5 for identification of K-series award program.

The immediate future for the K series can be seen in Table 6. The budget history of the Research Career Development series, including the RCA (of which 60 were still active in 1984), shows that the funding remained essentially level from 1979 to 1983 with a consequent loss of purchasing power until fiscal 1984. In FY 85 the Congress injected considerable support, primarily for physician scientist training. The drop in the estimate for 1986 is occasioned by the need for the institutes to respond to program demands in other budget categories.

Table 6

RESEARCH CAREER DEVELOPMENT AWARDS

Year	Dollar Obligations (in thousands)	Number of Awards
1979	$48,924	1,339
1980	49,506	1,344
1981	50,492	1,252
1982	50,736	1,236
1983	50,284	1,187
1984	53,645	1,208**
1985*	75,081	1,335
1986*	74,083	1,284

* Estimate

** Salary Ceiling Raised

Finally, a word about other opportunities in the NIH Intramural program for the young clinician. The newest program at NIH is a joint project with the Howard Hughes Medical Institute (HHMI). This program will support up to 30 medical students a year working with leading NIH intramural scientists on the NIH campus for periods of nine months to one year. With only three months to advertise the program, NIH received 66 applications for the first deadline,

February 1985. The NIH also offers clinical electives in 12 subjects for medical students during an 8 to 10 week self-financed experience. In 1984, 175 medical students took advantage of this program. Another option for medical students is a research fellowship program during the summer months. The number of positions varies with available resources, which in 1984 were sufficient for 97 students.

In conclusion, the NIH has sought, through the NRSA program and the Research Career Development Awards program, to enhance the nation's capability to conduct scientific research. The NRSA program provides equal numbers of predoctoral and postdoctoral training positions, directly to individuals or to eligible students through educational institutions. The number of individuals trained under the NRSA program has been remarkably constant, despite annual administration efforts to cut the budget. The decline in the number of physicians in research training has been addressed vigorously since 1978 with a combination of programs at all levels of training, and it appears to have at least leveled off.

Strategies to correct the loss of physician-scientists include emphasizing postgraduate research training lasting at least two years, stressing the basic science component, and increasing the NRSA stipend to a level comparable to housestaff salaries. Advanced research training is accomplished through the K series or Research Career Development awards. These awards are intended as a bridge between postgraduate fellowships and established faculty investigator positions. Although the program is small, it provides an important first step for promising young investigators.