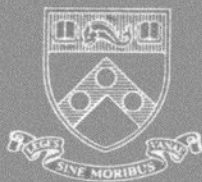


**Five Year Plan
1987-1991**



**University of Pennsylvania
School
of
Medicine**

To the University Community:

The following document is the sixth in a series of School five-year plans to be published For Comment. This draft has been considered by the Academic Planning and Budget Committee, as well as by the University administration, and it will be revised periodically by the School. Readers are urged to bear in mind the University tenets on future scale, which can be found in "Choosing Penn's Future."

Comments concerning this draft should be sent to Dean Edward Stemmler at the School of Medicine, 2nd floor, Medical Laboratories Building/6055.

—Sheldon Hackney, President

—Thomas Ehrlich, Provost

School of Medicine Five Year Plan: 1987-1991

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The School of Medicine

Five Year Plan: 1987-1991

I. Executive Summary

The School of Medicine's Five Year Plan recounts the history and progress of the School over the past five years, details the current status of the School and the internal and external issues likely to influence its future, and outlines a set of plans for the next five years. The document draws heavily upon reports and discussions of the School's Long Range Planning Committee (LRPC) and its Subcommittees, and has been approved in its entirety by the LRPC. The preparation and presentation of five year plans are part of an on-going planning process established in 1974 and, therefore, the document should be viewed as representing a current view rather than as a fixed or rigid prescriptive statement.

During the past five years, the School of Medicine realized significant progress in its programmatic efforts in education, research, and clinical services. In education, the School developed and implemented a revised undergraduate medical curriculum and began reducing the size of its first-year class of medical students. It also reorganized graduate (Ph.D.) studies in the biomedical sciences that included the appointment of a Director of Biomedical Graduate Studies to lead and coordinate the University's thirteen biomedical graduate groups, created a graduate group in neuroscience, and organized a more broadly based graduate group in molecular biology by a merger of the existing graduate groups in molecular biology, microbiology, and genetics. The size of the School's tenured and tenure-accruing faculty remained relatively stable and the number of faculty in the research and clinician-educator tracks increased. Eight new department chairpersons were recruited, and eleven endowed faculty chairs were established.

In research, School faculty expanded their efforts across the spectrum of programs in the biomedical sciences as indicated by the increase in the School's sponsored grants and contracts funding, which exceeded \$66.3 million in FY 1986. In addition, the School negotiated a long-term lease agreement with the Howard Hughes Medical Institute to locate a major research facility at the Medical Center, developed plans for a new Clinical Research Building, began a study to examine, reevaluate, and refine its major research themes, appointed new directors for four centers and institutes, and developed plans to provide state-of-the-art animal care facilities through renovation and new construction.

In clinical services, since FY 1982 the School completed the consolidation of all clinical practices into the Clinical Practices of the University of Pennsylvania (CPUP). This achievement permits the more effective management of clinical services with resulting improvements in patient care, strengthens the School's financial foundation, principally at the

departmental level, and allows the School to support its varied programs.

Over the next five years, academic medical centers face potential reductions in funding for biomedical research and support for undergraduate and graduate medical education. In addition, there will be significant changes in health care delivery systems and reimbursement policies. Increases in medical student tuition should be contained if the School is to continue to attract the most qualified applicants and maintain a diversified student population in a time of shrinking applicant pools.

In light of newly emerging models of health care delivery systems, the School will continue to examine the relationships with its affiliated hospitals regarding their role in the School's educational programs.

During the next five years, the School plans to enhance its research, educational, and clinical programs by: continuing to rely on departments as the major building blocks of the School; developing activities in programmatic formats; and maintaining its commitment to provide quality facilities and other resources.

The School will proceed with the construction of the Clinical Research Building. Construction and maintenance of the building will require substantial capital and operating funds. While the capital funds have already been identified, operating expenses have to be met during the life of the building and, therefore, pose a potential risk to the School's budget. The School has developed contingency plans if circumstances warrant, but the School's leadership is confident that the School can and will meet these costs.

The School will continue to develop curriculum programs which emphasize learning in small groups and which accommodate the expanding and changing fields of scientific and medical knowledge. In its educational and research programs, the School will concentrate on augmenting its existing strengths while mounting programs in emerging fields of science. The School is committed to identifying new revenue sources in order to maintain faculty salary levels that are competitive with its peer institutions and to finance needed capital improvements. Quality animal care facilities are critically important to the School's research programs; the School plans to spend more than \$15 million renovating and constructing animal care facilities which will satisfy all guidelines and regulations.

The allocation of resources over the next five years, among a number of options, will require careful planning, creative program development, competent management, and strong and sensitive leadership prepared to make difficult decisions.

II. Introduction

The School of Medicine stands poised at a critical juncture. New developments in biomedical education and research and in clinical services have made institutions of medical education extraordinarily exciting places for faculty and students. The School is an integral part of the University and the School's opportunities are also the University's. But these opportunities are not without unprecedented and, perhaps, escalating risks.

In contrast to the relative stability which shielded academic medical centers through the 1960's and early 1970's, schools of medicine across the country today are facing increasing uncertainty and potentially sharp reductions in funding for biomedical research and support for undergraduate and graduate medical education. In addition, as a result of rapid changes in the organization of health care services, a price-competitive market is emerging, carrying with it potentially damaging effects on the research and educational missions of academic medical centers. The organization, financing, and very nature of academic medical centers are being altered, and these changes pose serious challenges to the future of academic medicine.

Critical to the success of the School of Medicine in this uncertain environment is its ability to continue to attract outstanding educators, clinicians, and researchers, to offer unique and innovative programs of exceptional quality, and to draw talented and curious students. The School's missions—education, research, and clinical service—complement each other, yet only through imaginative management can the demands for scarce resources be balanced effectively.

In addition to severe changes in its external environment, the School finds itself in a new management and planning structure within the University. The University has recently announced formation of the University of Pennsylvania Medical Center, consisting of the School of Medicine, the Hospital of the University of Pennsylvania (HUP), and the Clinical Practices of the University of Pennsylvania (CPUP). While the School will continue to operate as other Schools within the University, and the Dean will continue to report to the Provost, the School will now be in a position to coordinate more effectively its planning activities with HUP and CPUP through the Executive Vice President of the Medical Center. Through the collaborative development and programmatic planning implicit in this new structure, the School's education, research, and clinical service missions will be enhanced.

III. The Past Five Years: FY 1982-1986

The past five years have been noteworthy for the School of Medicine. In education, the caliber of students has remained consistently outstanding and interest in attending the School has remained high despite a nationwide decline in applications to schools of medicine. In research, the School has continued to increase its externally supported research dollars, which have increased almost 40 percent during the past five years. In clinical services, the School has completed the consolidation of all clinical practices into CPUP.

A. Education

The School's 824 full-time faculty members (including research track faculty and full-time faculty at the School's affiliated hospitals) currently share responsibility for educating and training 657 medical students, a major portion of the University's 352 biomedical graduate (Ph.D.) students, and 653 residents and clinical fellows at the Hospital of the University of Pennsylvania. Unlike most other Schools in the University, a large proportion of the teaching in the School of Medicine takes place in small groups and on a one-to-one basis in the laboratory or at the bedside, rather than in a more traditional classroom setting.

Undergraduate Medical Education—The collaborative efforts of faculty, students, and administration over the past five years have resulted in significant improvements in the School's program for undergraduate medical education. Besides the development of a revised and enhanced curriculum, the major changes have been the appointment of Academic Coordinators for all departments and the establishment of an Academic Coordinators Council. Other developments include the creation of a computer laboratory and integration of computer-based education into the curriculum, the initiation of courses for faculty development, and the enhancement of the career counseling system.

A faculty subcommittee of the Long Range Planning Committee recently reviewed requirements for admission to the M.D. program with the purpose of allowing potential applicants more flexibility in the choice of premedical courses. By eliminating required courses and substituting outlines of the knowledge and skills necessary for engaging in the School of Medicine curriculum, the School encourages students to obtain a broad education in the liberal arts, while undertaking preparation in the sciences which is appropriately rigorous. To encourage careers in academic medicine, the School initiated in 1984 the Charles A. Dana Foundation Clinical Research Training Program. The training program accepts five highly qualified medical students per year from United States schools of medicine who spend a full year learning research methods and participating in research projects.

Over the past five years, the School of Medicine has developed a

variety of mechanisms for improving the capability of the School to evaluate the quality of its educational programs. The School has implemented a system which provides documentation of the teaching effectiveness of all faculty being considered for promotion to the associate and full professor level in all tracks. In the past five years the School has reviewed in-depth nearly all of its required educational programs and will continue to conduct biennial reviews of each department's teaching programs. Outside consultants have been engaged to provide recommendations as to how these programs can be improved. The School has also developed a system to improve the assessment of its students' clinical competency. As a result, each clinical department has agreed on a set of standards for the evaluation of clinical competency.

The cost and financing of medical education are major concerns of the School. Although tuition rose 43.1 percent, from \$9,490 in FY 1982 to \$13,580 in FY 1986, faculty planning committees have acted to ensure that the School's tuition is no longer among the highest of its peer institutions. Yet, although tuition increases have moderated, the average indebtedness of School graduates has risen significantly, reflecting the national trend. According to survey responses, the average debt of a 1981 graduate was \$26,000, while the average debt of a 1985 graduate was \$33,104, a sharp increase of 27.3 percent, due primarily to increases in tuition, costs of living, and interest costs on borrowings.

The size of the medical student program is also of concern to the School. An assessment of the School's academic programs by the Long Range Planning Subcommittee on Undergraduate Medical Education reinforced the opinion that a smaller class size would have the desired result of decreasing the student-to-faculty ratio, and also recognized the recent nation-wide decline in the number of applicants to all schools of medicine. Over the past twenty years, the School had responded to the nation's demand for more physicians by increasing its class size. The School believes that its optimal program size requires a reduction of class size and that it can now return to the number of students enrolled in the School before the nation-wide expansion of medical school classes in the 1960's.

These considerations led the School's Long Range Planning Subcommittee on Undergraduate Medical Education, primarily in the interests of maintaining quality education, to recommend that the School reduce the size of its first-year class. On the advice of the Medical Faculty Senate, the class was reduced in 1983 from 160 students (which had been the size since 1971) to 155 students. Currently the entering class size is 155; for FY 1988 the entering class will be 150. Between FY 1982 and FY 1986, the School experienced a 14.9 percent decline in applications, to 5,193;

however, the School still receives 34 applications for each place in the first-year class, one of the highest ratios in the country.

Pre-Baccalaureate Education—Although the School is not primarily oriented to the education of pre-baccalaureate students, School faculty have developed model curricula with their colleagues who teach undergraduates in the School of Arts and Sciences, the School of Engineering and Applied Science, and the School of Nursing. These efforts enable students with special interests in the humanities, social sciences, physical sciences, or biological sciences to choose courses of study leading to potential careers in medicine and other health-related professions.

Graduate (Ph.D.) Education and M.D./Ph.D. Program—By authority granted the School by the Provost, nearly all University graduate (Ph.D.) studies in biomedical sciences were reorganized under the aegis of the Biomedical Graduate Studies program. A director of Biomedical Graduate Studies was appointed, a graduate group in neuroscience was created, a more broadly based graduate group in molecular biology was organized by a merger of the existing graduate groups in molecular biology, microbiology, and genetics, and a post-M.D. Masters degree program in clinical epidemiology was approved by the University and implemented.

Minority Student Education—Over the past five years, the School of Medicine has maintained its commitment to increasing minority presence among its medical student population. Despite vigorous efforts during this period, the number of minority students has fluctuated between 7.3 percent and approximately 10 percent of the first-year class. While this figure is unacceptably low, the School since 1981 has initiated several programs to increase the number of minority students. The Office of the Associate Dean for Minority Affairs has established a Minority Affairs Council, prepared a *Minority Guide to the First Year*, developed special orientation programs and sessions for entering students, and increased minority involvement and representation on the Admissions Committee and interviewing panels. The Minority Affairs Office also initiated the Mossell Lecture Series (named for the School's first black graduate) and instituted a series of informal, informational luncheons for minority applicants during interview sessions.

The School has also developed programs aimed at increasing its visibility in and service to the minority community. The School has created programs: to provide area high school students and counselors with speakers on and information about undergraduate preparation, application, and matriculation to the School of Medicine; to strengthen the School's participation in minority professional organizations and conferences concerned with health careers; and to provide opportunities for minority involvement in delivering health care services to minority populations and communities.

Table 1 details the number of medical students, graduate (Ph.D.) students, and interns, residents, and fellows studying at the School and HUP during FY 1982 to FY 1986.

Table 1
Student Enrollments
Fiscal Years 1982-1986

Fiscal Year	Medical Students ¹	Graduate (Ph.D.) Students ^{1,2}	Graduate Medical Students/House Staff (Interns, Residents, Fellows) ³	Clinical Epidemiology Program	Total
1982	679	351	612		1,642
1983	664	357	635		1,656
1984	662	355	656		1,673
1985	662	352	653		1,667
1986	657	352	653	10	1,672

¹ Approximately 70 students per year were combined degree candidates (i.e., M.D./Ph.D., M.D./M.B.A., M.D./J.D.) and approximately 62 are counted under both the M.D. and Ph.D. categories.

² Prior to FY 1985, biomedical graduate students were enrolled through the School of Arts and Sciences and exact figures are unavailable.

³ Figures for HUP only, and excludes figures for affiliated teaching hospitals.
Source: Program Offices.

Table 2 demonstrates that the male/female composition of the entering class of undergraduate medical students has remained relatively constant over the past five years, corresponding roughly to applicant patterns.

Table 2
Applications And Admissions Figures, By Sex
Fiscal Years 1982-1986

Fiscal Year	Total Applications			Matriculated Students ¹		
	Male	Female	Total	Male	Female	Total
1982	4,060	2,039	6,099	112	48	160(10)
1983	3,720	2,019	5,739	98	58	156(15)
1984	3,721	2,088	5,809	90	65	155(9)
1985	3,402	1,965	5,367	101	54	155(14)
1986	3,277	1,916	5,193	94	61	155(17)

¹ () indicates number of matriculated underrepresented minorities.
Source: AMCAS Action Summaries, 1982-1985.

B. Research

The School's excellence in research is recognized nationally and internationally. In FY 1986, the School received more than \$66.3 million in grants and contracts, an increase of more than \$8.0 million or 11.3 percent during the past year. Currently, 340 faculty members, or nearly three-quarters of the tenured and tenure-accruing faculty, are principal investigators on sponsored research grants. At last count, the School's faculty included one Nobel-laureate, 17 members of the National Academy of Sciences, eight members of the Institute of Medicine, 11 members of the American Academy of Arts and Sciences, and five members of the American Philosophical Society. In 1986 alone, two members of the faculty received Guggenheim Awards.

The School conducts research throughout the range of biomedical science. In 1982, the Long Range Planning Committee identified eight major research themes it believed central to future biomedical research at the School: biomedical imaging; cancer; cardiovascular disease; computer technology; diabetes; immunology; molecular genetics; and the neurosciences. The School promotes interdisciplinary research programs in each of these areas. These programs cut across departmental lines to form a matrix which encourages participation from many departments and provides reciprocal benefits. It is important to note that many faculty are engaged in research activities not included in these eight areas and that the research contributions of School faculty extend across a wide spectrum. Recognizing this, as well as the ever-changing nature of scientific exploration, the Long Range Planning Subcommittee on Institutional Research and Training is currently reevaluating and refining the research areas which should be emphasized by the School.

Over the past five years, the School of Medicine has advanced to the forefront of biomedical research involving imaging systems. Through a conscious commitment of resources, the School has attracted leading researchers in the field and devevanded computer system, and participates heavily in developmental and evaluative research. The School has entered into a number of collaborative programs with private manufacturers and developers and fully expects to continue pursuing these relationships.

A significant addition to the School's research efforts over the past five years was the decision in 1985 by the Howard Hughes Medical Institute (HHMI) and the University to locate a major research facility on the campus. The current research foci of the HHMI—genetics, immunology, metabolic regulation, and neuroscience—relate well to research activities carried out in a number of the School's departments, centers, and institutes.

C. Clinical Services

Through 15 clinical departments, the clinical faculty of the School transfer many of the advances from basic science and clinical research to new modalities of patient care and provide health care services to a population of patients from a wide geographic area. The provision of clinical services is a critical component of the School's mission and is a complementary priority to teaching and research. It also serves to strengthen the bonds between the University and the surrounding community, whose residents receive a substantial amount of health care from the Hospital of the University of Pennsylvania (HUP).

Over the past five years, all clinical practices were consolidated into the Clinical Practices of the University of Pennsylvania (CPUP). All clinical departments now participate in the system, and all newly appointed clinicians in the School are full-time faculty of the University and participants in CPUP.

The growth in clinical services since FY 1982 has been substantial. Initially, this was due primarily to the beneficial consequences of the establishment of CPUP. Since FY 1983, other factors in the growth are increases in admissions and out-patient visits. Concurrently, the percentage of the School's budget whose source is clinical income has also grown. In FY 1982, clinical income accounted for 45.8 percent of the School's total budget. By FY 1986, this figure had increased to 53.0 percent.

D. Resources: Finances, Faculty, and Facilities

The financial health of the School is critically connected to the vitality of its research programs and clinical practices, as eighty-five percent of the School's revenues are derived from these sources (Table 3). The School made significant progress during the past five years in increasing the percentage of salary its faculty receive from grants and contracts and in limiting the growth in unrestricted salary support. It is the policy of the School that salary taken from grants and contracts equal the percentage of effort dedicated to these activities.

Table 3
Revenue By Source
Fiscal Years 1982-1986
(\$ Millions)

Fiscal Year	Clinical		Grants and Contracts ¹		Tuition		Other ²		Total Revenue
	\$	%	\$	%	\$	%	\$	%	
1982	63.5	45.8	48.7	35.1	5.4	3.9	21.1	15.2	138.7
1983	76.8	50.9	49.8	33.0	5.9	3.9	18.5	12.3	151.0
1984	89.0	51.5	57.7	33.4	6.7	3.9	19.5	11.3	172.9
1985	94.6	52.6	58.2	32.3	7.2	4.0	20.1	11.2	180.1
1986	109.4	53.0	66.3	32.1	7.4	3.6	23.5	11.4	206.6

¹ Includes indirect cost recoveries.

² Other revenue sources include: investment income; state appropriation; subvention; and clinical practices contribution.

Source: Annual Reports of the Subcommittee on Medical School Finance, 1982-1986.

The School's faculty are its most important resource. Since 1982, eleven endowed chairs have been established at the School, raising the total to 49. (Twenty-four of the School's 49 endowed chairs have been established since 1974, during the tenure of the School's current administration.) During the same period, eight new chairpersons have been recruited. In FY 1986, the School had 802 fully-employed faculty (including research track faculty), an increase of 2.3 percent since FY 1982. The size of the tenured faculty has remained relatively constant in size, decreasing from 250 in FY 1982 to 246 in FY 1986.

The major increase in faculty occurred in the research and clinician-educator tracks, created during the 1970's in response to the changing needs of academic medical centers. Over the recent five-year period, the number of faculty in the research track has grown from 54 to 73, a 35.2 percent increase; the number of faculty in the clinician-educator track has

Table 4
Expenses (Restricted and Unrestricted)
Fiscal Years 1982-1986
(\$ Millions)

	1982 \$	1983 \$	1984 \$	1985 \$	1986 \$
Academic Salaries	53.3	61.3	68.1	67.2	80.0
Administrative & Professional Salaries	9.1	9.6	10.4	12.9	14.2
Clerical & Technical Salaries	5.6	5.9	6.2	6.3	6.5
Service Salaries	1.5	1.6	1.5	1.6	1.7
Employee Benefits	13.1	15.7	19.2	19.0	20.9
Total, Salaries & Employee Benefits	82.6	94.1	105.4	107.0	123.2
Current Expenses	28.8	31.8	38.5	45.1	55.9
Equipment	3.3	3.2	5.8	4.8	7.2
Financial Aid	1.9	2.2	2.6	2.8	2.4
Allocated Costs	12.3	14.0	14.7	15.4	17.2
Total	128.9	145.3	167.0	175.1	206.2

Source: Annual Reports of the Subcommittee on Medical School Finance, 1982-1986.

grown from 151 to 269, a 78.1 percent increase. A significant portion of the growth in the clinician-educator track was due to the process of shifting the status of physicians, both at HUP and at affiliated hospitals, from part-time status to that of fully-employed members of the faculty. This shift was a result of the policy adopted by the School requiring faculty to have fully-employed status in order to participate in CPUP.

The total female faculty has increased 67.6 percent, from 105 to 176 between FY 1981 and FY 1985. Over this period, the School has gained three full-time tenured female faculty members. The School had 12 full-time tenured minority faculty members in FY 1985, an increase of 50 percent, or four faculty since FY 1981. However, total minority faculty members dropped from 62 to 57.

To support its programs, the School has spent over \$30 million in capital funds over the past five years for projects either completed or now under construction to improve, modernize, and renovate existing sub-standard laboratory space. However, in order to accommodate fully its extensive research programs and to maintain its position relative to its peer institutions, the School has recognized that it must plan and develop new facilities. The School's planning process identifies its facilities needs through regular programmatic reviews of all departments, centers, and institutes and documents its plans in a continually up-dated Master Plan. In the Spring of 1984, the Long Range Planning Committee, adopting the report of its Subcommittee on Educational Facilities, recommended construction of a 105,000 net square feet (nsf) (now scaled at 118,000 nsf) Clinical Research Building to satisfy the School's need to house current and planned research programs, including the HHMI. On June 21, 1985, the Trustees of the University authorized the expenditure of funds for the design of this new facility. On January 16, 1987, the Trustee Committee on Budget and Finance authorized the construction of the Clinical Research Building at an estimated cost of \$53.8 million.

The Division of Laboratory Animal Medicine (DLAM) has been the focus of considerable attention over the past five years. Following the recommendations of the Task Force on Laboratory Animal Medicine in 1982, the School is now constructing new state-of-the-art animal care facilities in the Medical Education Building at a cost of approximately \$4.4 million. The School has also renovated the existing animal care facilities in the Richards and Medical Laboratories Buildings. In 1985, an Ad Hoc Task Force on Animal Care Facilities reviewed the School's long-term animal care needs and confirmed the 1982 recommendation that a new facility must be constructed to permit the decommissioning of outdated and inadequate facilities. The School is committed to the long-range plan developed by the two task forces and is evaluating site and financing requirements for a new 23,000 nsf animal care facility.

IV. The Five Year Plan: FY 1987-1991

In an environment of considerable change and uncertainty, the planning concepts which have contributed to enhancing the School's position of excellence and leadership will remain its guideposts. These concepts are: 1) that departments continue to be the major building blocks of the School; 2) that new activities be developed in programmatic formats; and 3) that the School continue to recruit quality faculty and to maintain and develop quality facilities. The School, consistent with trends in modern biomedical research, encourages interdisciplinary programs which cut across departmental boundaries. The School's five year plan is designed to maximize the School's opportunities while keeping alert to the potential risks to its posture.

A. Education

Educating a new generation of physicians and biomedical investigators at a time when biomedical knowledge is rapidly expanding and resources from public agencies for educational loans, fellowships, and training grants are shrinking presents enormous opportunities and formidable challenges.

Undergraduate Medical Education—The public financial foundations for undergraduate medical education are eroding. In recent years, the rising cost of tuition, combined with a growing scarcity of low interest loans, has prompted concerns that many qualified, potential applicants to schools of medicine may elect other careers. Moreover, students who do enter such programs and assume substantial debt may not opt for less financially rewarding careers in research, depriving the profession of the trained physician-investigators required to advance academic medicine and biomedical science. To counter these trends, the School will continue past efforts to moderate tuition increases and to seek additional sources for student financial aid.

The recent exponential advances in medical knowledge have created serious curriculum issues. In the view of many medical educators, an excessive amount of factual knowledge must be learned in medical school, permitting many students insufficient time to engage in activities other than attending class and studying. The School will continue the ongoing process of evaluating undergraduate medical education in order to present a curriculum which provides students with the necessary knowledge and skills. Particular emphasis will be placed on small-group instruction. Additionally, a goal of the School is to provide an educational environment that encourages an interest in academic medicine by providing a learning continuum that bridges the undergraduate medical and the residency/fellowship years.

In cooperation with several other peer institutions, the School has initiated a two-year, fundamental assessment of medical school education. Already under consideration are programs to improve clinical undergraduate medical education to make the educational experience more relevant to the future practice of medicine.

Based upon work done over the past two years in developing standards for the evaluation of clinical competency, the School plans to develop a more comprehensive approach to the evaluation of the clinical competency of its medical students. This new program will include increased direct observation of clinical performance as well as the use of simulators and other means such as computers to provide data on the broad scope of competencies required of the physician. The program will also include better methods for providing students feedback on their strengths and weaknesses so as to enhance their personal and professional development.

The School also anticipates implementing new learning experiences in behavioral science, ethics, biostatistics, preventive medicine, and geriatrics. Plans are being implemented to introduce into the curriculum regular colloquia where small groups of students will study and discuss

selected topics in areas such as these.

In the basic science years, the School plans to move toward additional problem-based learning, independent study, and small group discussion. The present size of the School's basic science faculty will enable the School to meet these educational goals without recruiting additional faculty for this program. As part of this effort, a curriculum review currently underway will include recommendations on how to re-incorporate the basic sciences into the fourth year of medical school.

Graduate (Ph.D.) Education and M.D./Ph.D. Program—Financial pressures constitute a major threat to graduate education in the biomedical sciences. The current federal administration FY 1988 budget proposes stable or slightly increased support for training grants, a major source of funding for graduate students and for M.D./Ph.D. candidates. Unless there are increases in support for research training grants to match increased educational costs, efforts to train the next generation of biomedical investigators will be severely jeopardized. To fill part of the prospective gap, the Biomedical Graduate Studies program will seek additional funds and work with the University to ensure that graduate student tuition is within the range of peer institutions and that University tuition tax practices do not place too heavy a burden on academic programs.

Over the next five years, the School will continue to consolidate and strengthen Biomedical Graduate Studies. The recently implemented core courses will be enhanced and additional courses will be developed in the areas of developmental biology, membrane biology, molecular biology, pathobiology, and structural biology.

Graduate Medical (Resident) Education—A major public policy issue confronting academic medical centers nationwide is whether the current distribution of physicians by specialty is in the appropriate balance for health care delivery. A serious question is whether this Medical Center should contract some of its residency training programs. Because of the high quality of its programs, however, there is a general belief within the School that, within the limits of resources available for resident salaries, the size of the programs should be maintained.

A second issue is the prospective change in federal budgeting that will severely reduce funding for graduate medical (resident) education. The regulations now governing the federal prospective reimbursement program for Medicare allow a "pass-through" of costs related to graduate medical education. Under the Consolidated Omnibus Budget Reconciliation Act (COBRA) of 1986, reimbursement limits were set for each hospital. Accordingly, the Medical Center is limited to those costs. Further, COBRA defined the types of residents affected by the cost limits. In general, all residents beyond PG-5 will receive only partial funding. Under the proposed federal administration budget for FY 1988, further limitations on both direct and indirect medical education payments are included. In an increasingly competitive economic environment for university-affiliated teaching hospitals, these changes will significantly impair the Medical Center's capacity to finance resident education. It is important for the future of medical education that funding up to primary board eligibility be maintained.

Minority Student Education—The School of Medicine is committed to increasing its number of minority students. The School will continue to commit resources to the Office of the Associate Dean for Minority Affairs to enable it to augment recent program initiatives. A study is underway to determine why accepted minority students decide not to matriculate and/or to attend other schools. This study will enable the School to supplement existing programs intended to increase the percentage and number of minority matriculants.

Table 5 reports projected enrollments for medical students, graduate (Ph.D.) students, and interns, residents, and fellows studying or being trained at the School and HUP for FY 1987 to FY 1991.

Table 5
Projected Student Enrollments
Fiscal Years 1987-1991

Academic Year	Medical Students ¹	Graduate (Ph.D.) Students ¹	Graduate Med. Students /Housestaff ²	Clinical Epidemiology Program	Total
1987	650	317	653	12	1,632
1988	645	292	653	12	1,602
1989	640	250	653	12	1,555
1990	635	250	653	12	1,550
1991	630	250	653	12	1,545

¹ Approximately 75 students per year are combined degree candidates (i.e., M.D./Ph.D., M.D./M.B.A., M.D./J.D.) and approximately 62 are counted under both Medical Students and Graduate (Ph.D.) Students.

² Figures for HUP only, and excludes figures for affiliated teaching hospitals.
Source: Program Offices

B. Research

In recent decades, dramatic advances in biomedical research have brought deeper understanding of biological structure and function, and considerable opportunities for additional breakthroughs. The School is one of the nation's leading schools of medicine in biomedical research, ranking seventh in the amount of NIH research funds procured in federal FY 1985. The decision by the Howard Hughes Medical Institute to locate a research facility at the Medical Center and the decision by the School to construct a new Clinical Research Building present significant opportunities to enhance scientific research at the University.

The threats to research, however, are real and immediate. The projected reduction in external research support jeopardizes the School's research programs. Approximately 80 percent of the School's grant and contract funding comes from the National Institutes of Health (NIH). Obviously, this puts the School's research at great risk if there is instability in the NIH budget. The federal administration FY 1988 budget proposes a decrease in research funding for NIH. The proposed FY 1988 federal budget includes funding for 19,131 research grants, but could reduce the number of new awards by approximately 12 percent. This is the third consecutive year that the federal administration has proposed strategies to reduce the number of competing NIH-supported research grants. None of these strategies so far has been successful. Additionally, a policy has been considered which would reimburse less than full indirect costs on grants. The Gramm-Rudman-Hollings deficit reduction legislation, if fully implemented, would force even tighter constraints. Staff analysis from the House Select Committee on Aging asserts that the federal budget for health research could be slashed by almost one-third by 1990. These policy issues are of concern since the future of all of the School's departments is closely tied to trends in NIH funding.

In the face of these prospective difficulties, the School plans to build on existing strengths, while remaining sufficiently flexible to mount programs in major new areas of science. The School will continue to encourage interdisciplinary research efforts and to invite greater collaboration between the basic science and clinical departments.

These efforts will be guided by the 1987 Report of the Subcommittee on Institutional Research and Training. The Subcommittee assessed the present science activities of the School by subdividing biomedical research into 22 categories which indicate the School's strengths and areas for reinforcement. Combining this analysis of the School's programs with its evaluation of probable future trends and "frontier" areas in biomedical science, the Subcommittee recommended research areas for future investment at the School and institutional strategies to promote investigation. The Subcommittee's refinement of the 1982 Plan, which identified eight areas for intensive focus, represents the School's most recent attempt to update and reassess its future research objectives.

In its report, the Subcommittee cited "a general need, in all research areas, for competence in using the tools of modern molecular biology and molecular genetics." It advocated the recruitment of senior scientists "to open new sub-areas and to link areas" and the need to promote

effective interactions and redirections of existing faculty. In addition to additional efforts in molecular biology, the Subcommittee recommended that the School begin to direct resources toward "frontier areas," notably structural and functional characterization of gene protein products. The use of nuclear magnetic resonance and X-ray-based methods, in conjunction with light microscopy and electron microscopy, will enable new studies of macromolecular structure and function in explorations of modern structural biology.

Guided by the Subcommittee's recommendations, the School is committed to increased institutional investment in neuroscience, immunology, genetics, metabolism/bioenergetics/spectroscopy, bioengineering, muscle research, and cancer research, and the development of an institutional plan to promote research in cardiovascular disease, particularly in the pathogenesis of atherosclerosis and hypertension. Other areas for possible future investment include endocrinology (including diabetes), biochemical pharmacology, reproductive biology, pulmonary research, hematopoietic research, and virology. For the future, the School recognizes the need to recruit individuals and develop programs capable of effectively bridging modern fundamental research with applications in treating human disease. This is true not only in the area of cardiovascular disease, but also in such areas as neuroscience, immunology, genetics, cancer, and diabetes, all cited as areas for future investment in both the 1982 Long Range Planning Committee report and the 1987 Subcommittee report. While committed to enhancing its programs in these critical areas, the School continues to recognize the important role of investigators in other areas of biomedical research.

The Howard Hughes Medical Institute's investigators will play a unique role as collaborators in the future research activities of the School. HHMI investigators will pursue research in scientific areas decided upon jointly by the Institute and School. It is anticipated that the HHMI research will relate to many of the research programs in the School. The HHMI expects to recruit approximately 13 junior and senior investigators, six of whom have already been appointed. These investigators are jointly recruited with the School and hold appointments in School departments; however, the investigators are employees of the Institute, and all salary, benefits, and related costs of these appointments are assumed by the HHMI.

The School has already taken steps to ensure its future research viability. The Clinical Research Building, to be completed in 1989, will provide the facilities and space required to develop specific programs in the areas identified for future investment. The School has also begun an institution-wide effort to recruit senior faculty in genetics, neuroscience, and immunology, areas already strong at the School and areas of principal research interest of the HHMI. The Dean has charged three faculty search committees, comprised of members of several School departments, with identifying distinguished scientists with specific research interests who might become HHMI investigators and/or faculty of the School. With facilities in place, outstanding faculty will initiate the specific programs and projects that will maintain the School's position as a national leader in biomedical research.

C. Clinical Services

The School recognizes that a great deal of uncertainty surrounds the possible alternatives in health care delivery and the recent attempts to limit health care costs. Significant changes in delivery mechanisms, reimbursement and financing procedures, and malpractice expenses are currently being experienced, and further changes are a certainty.

A major source of concern within the changing health care environment is the emergence and growth of so-called managed care systems, most notably Health Maintenance Organizations (HMO's). These organizations, with an estimated 600,000 subscribers in the Delaware Valley area, deliver a comprehensive range of health care services, often for less cost than traditional modes of medical care. These organizations seek the lowest possible price for services by contracting for many of their services with community hospitals, which do not bear the costs of medical education and research incumbent upon university teaching hospitals. As a result, academic medical centers whose costs are higher than community hospitals find themselves at a competitive disadvantage

when cost is the principal factor in the purchase of services by HMO's.

In addition, the traditional university hospital advantage as a center for complex and highly specialized care is dissipating as more community hospitals offer these services. In one approach to compete with the emerging managed care systems, the Medical Center may have to develop a primary care delivery network and adopt other creative approaches to be assured of a referral pool of patients which will maintain the financial stability of the Medical Center and support the School's educational missions.

Significant and increasing financial risks emerge from developments in the private health care sector. With the recent dramatic increase in the cost of liability insurance, malpractice insurance expenses for CPUP, projected to rise from \$6 million in 1985 to \$10.5 million in 1991, represent a threat to the fiscal stability of the clinical practices. However, CPUP has created a \$17 million, self-insured malpractice pool which it believes covers its risk and reduces the financial threat. The School's clinical departments are taking steps to reduce malpractice exposure and thus limit malpractice liability, but these measures will be only partially successful without changes in the many factors that are related to the way insurance liability is determined by the insurance industry, in jury awards, and/or in state regulatory agencies.

Several legislative initiatives seeking to contain health care costs loom as potential threats to the clinical practices. These initiatives will introduce new forms of medical care service delivery (e.g., reimbursement for certain procedures on an out-patient basis only) and/or different approaches to the financing of care. The Tax Equity and Fiscal Responsibility Act (TEFRA), enacted in 1982, established reimbursement limits on certain hospital ancillary services. These limits are now subject to adjustment for case mix, based on federal legislation for prospective pricing of Medicare hospital patients according to "Diagnosis Related Groups" (DRG's). To date, the overall impacts of TEFRA and of the DRG reimbursement regulations on the finances of the Medical Center have not had the negative effect that was initially anticipated when these became operational; however, the future risk is large.

Another health care cost issue relates to the inadequate reimbursement by the Commonwealth for care of Medicaid (medically indigent) patients. The School's faculty provides health care services to members of the Philadelphia community, many of whom are poor. As responsible institutional members of the community, the Medical Center and University are ethically bound to provide this care. The reimbursement from the Commonwealth, however, is far below the cost of providing these services and has the effect of causing part of the cost of the care for Medicaid patients to be borne by HUP and the clinical practices. This situation requires remedy at the Federal and Commonwealth policy level, and is currently being examined by a legislative committee of the Commonwealth.

Non-economic clinical concerns must also be resolved. Faculty members in clinical departments apportion their time among competing teaching, research, and patient care responsibilities. Unless the School and its individual departments protect faculty academic time, there is the risk that financial pressures to allot additional time to clinical services will increase. Continuation of this trend may lead full-time practitioners to limit their teaching and research activities. The School will continue to guard against this undesirable possibility.

Despite the conditions imposed by these uncertainties, the School is continuing to develop programs and plans which will maintain its position of national leadership in the innovative provision of health care. The School is examining ways to link fundamental science to clinical services, particularly in the areas of cancer, diabetes, cardiovascular, and mental and neurological disease. The new units now being built in the Phase IV construction at HUP will serve these efforts. The Medical Center has recently received approval to perform multi-organ, solid transplants, bringing to clinical practice the results of years of scientific and clinical research. With the acquisition of the Hilton Hotel, the Medical Center is now implementing new opportunities for providing ambulatory care. Finally, among many developing plans and programs, the Medical Center is investigating opportunities to affiliate with Health Maintenance Organizations and other private carriers to provide quality health care and assure the School of a steady pool of patients.

D. Resources: Finances, Faculty, and Facilities

The School of Medicine's financial projections reflect the challenges and opportunities it faces. While recognizing the costs involved in maintaining existing programs and developing new initiatives, the financial projections demonstrate the financial stability of the School. Projections through FY 1991 continue to show (decreasing) operating surpluses, despite reflecting the significant costs involved in operating the Clinical Research Building and hiring additional faculty. The projections for FY 1990 and 1991 highlight the high costs of operating the Clinical Research Building which must be absorbed. The School is concerned that significant increases in University allocated costs, leveling of revenue from research grants, and changes in federal reimbursement policies may affect these projections. Nevertheless, in actual past performance, the School has managed to maintain its programs and produce balanced budgets by prudent management. The School recognizes the risks involved in a plan which aggressively maintains its positions of leadership in biomedical research and education, but believes that the chances for success exceed the potential risks.

Clinical income accounts for approximately half the School of Medicine's budget, and threats to this revenue source are real. Discussions are taking place among federal health policy-makers regarding the establishment of a prospective payment system for physicians' fees modeled after the DRG system. Coupled with the increase in malpractice expense, this proposal, if implemented, could have a negative financial impact on the School's finances. In addition, increasing competition in the health care environment has contributed to the financial uncertainties.

Guaranteeing access to capital construction funds remains a continuous challenge. New facilities and renovations, such as the Clinical Research Building and the planned renovation and modernization of animal care facilities, are required to provide the School with the laboratories necessary for today's biomedical science and to keep it competitive with its peer institutions. It has become increasingly difficult to generate funds for these projects through internal sources. The School and University should examine more creative long-term funding strategies for capital projects since other sources of capital funds must be procured.

The School's financial projections are based on several key assumptions. Among them are that: revenue (both direct and indirect) from grants and contracts will increase 6 percent annually; CPUP revenue will increase 5.5 percent annually; and gift and drug studies revenue will increase 6.5 percent annually. Expenses for salaries are projected to

Table 6
Revenue and Expenses
Fiscal Years 1987-1991
(Including Clinical Research Building)
(\$ Thousands)

	1987	1988	1989	1990	1991
Unrestricted					
Revenue	\$34973	\$37160	\$39212	\$42556	\$45778
Expenses	34973	38298	41395	47653	51506
Net	0	(1138)	(2182)	(5097)	(5728)
Restricted					
Revenue	66787	71425	76427	82946	91428
Expenses	66787	70750	75419	81575	89661
Net	0	675	1008	1371	1767
Clinical Practices					
Revenue	115194	121539	128235	135299	142752
Expenses	107746	114244	120886	129792	137547
Net	7447	7295	7349	5506	5206
Total					
Revenue	216,953	230124	243874	260801	279958
Expenses	209506	223291	237700	259021	278714
Net	\$7448	\$6833	\$6174	\$1780	\$1245
Debt Service	0	0	(666)	(666)	(666)
Total School Performance	\$7448	\$6833	\$5508	\$1114	\$579

Source: Annual Report of Subcommittee on Medical School Finance, 1986.

increase 5.5 percent annually, while malpractice expenses are expected to increase 6 percent annually after a \$17 million reserve is accumulated by the end of FY 1987. All allocated costs are projected to increase between 6 and 7 percent annually.

To counter these challenges and maintain its position of leadership, the School of Medicine will have to assume certain calculated financial risks. It will continue to pursue vigorously the needed renovation and improvement of its physical plant. Over the next five years, the School will continue to revise and update its overall Master Space Plan. The estimated cost for the planned construction and renovation projects for the School through FY 1991 is approximately \$89.8 million, including \$53.8 million for construction of the Clinical Research Building and \$9.0 million for the construction of new animal care facilities in addition to those in the Clinical Research Building. These projects are expected to add approximately 110,000 nsf of new space to the School's inventory, after approximately 8,000 nsf of obsolete space are decommissioned.

As a result of careful planning within the School, most of the School's departments are in dynamic stages of development. This is the outcome of the renewal of the School's physical plant, the departmental review process, and the recruitment of outstanding department chairpersons and other faculty appointments. The strength of the School's programs has led to a situation in which most departments would prefer to continue program expansion. Future faculty growth in the School will come from normal growth within the School's current programs and space constraints and growth associated with the construction of the Clinical Research Building.

It is anticipated that the School's existing and planned programs over the next five years will require approximately 73 additional fully-employed faculty, most of them related to the programs planned for the Clinical Research Building. This is potentially an 8.9 percent increase in the number of fully-employed faculty. This growth will occur among both the tenure line faculty and the research and clinician educator tracks, with slightly greater growth in the research and clinician educator tracks (Table 7). Shifts from the tenure line to the research and clinician educator tracks are expected to be significant and are reflected in these projections. It is anticipated that it will take newly recruited faculty approximately three years to reach the goal of 50 percent of salary derived from grants and contracts. Research faculty, however, are expected to be fully supported from research grants after Year 2.

Table 7
Fully Employed Faculty
Fiscal Years 1987-1991

Fiscal Years	Tenured		Limited Tenure/Accruing		Research Track	Clinician Educator		Total Fully Employed
	Tenured	Accruing	Tenured	Subtotal		Track	Track	
1986-87	246	169	50	465	73	286		824
1988-89	249	166	45	460	78	301		839
1990-91	259	185	40	484	97	316		897

Source: Office of Resource Management.

The School plans to spend more than \$15 million over the next five years to construct a new animal care facility, renovate certain existing facilities, and close some facilities judged obsolete. In addition, the School will complete the work currently underway on animal care facilities in the Medical Education Building. These projects should provide the School with facilities sufficient to meet its long-term needs and to satisfy current animal care regulations.

The University's decision to hire a University Veterinarian will positively affect the School's efforts to continue to provide professional and appropriate animal care. The School anticipates that this new structure for overseeing and providing animal care throughout the University will support its animal care and animal research programs. The decision to locate the University Veterinarian within the School recognizes the signif-

icance of the School's animal care program to the University, but this position will require additional space and resources which must be shared with the University.

Over the next five years the School of Medicine will establish a centralized office for information management (medical informatics). The Office of Academic Programs will develop and implement a number of programs designed to improve the School's performance in research, education, health services, and general administration. Initial efforts will focus on establishing links to PennNet and Local Area Networks (LAN's) in each of the School's departments and administrative units. In cooperation with the Vice Provost for Computing new types of server and helper units will be developed and deployed. By 1990 the School will have direct links to a variety of biomedical data bases, access to advanced computer technology to assist in genetic modeling, and developed systems for transporting images to appropriate research and service sectors. Finally, the School intends to develop educational programs which will assist students in understanding and using information systems for biomedical research and the practice of medicine.

The School's medical alumni relations program is designed to increase alumni interest in and awareness of the University of Pennsylvania Medical Center, to encourage alumni involvement in School of Medicine activities, to strengthen alumni commitment to this institution, and to further the missions of the School. Specifically, during the next five years, the Office of Medical Alumni Relations will develop and implement an alumni program for graduate medical education alumni (graduates of the School's internship, residency, and fellowship training programs), will cultivate meaningful relationships between alumni and medical students, will expand and improve effective channels of communication with and between alumni, and will explore continuing medical education opportunities for graduates.

The centerpiece project for the School over the next five years is the Clinical Research Building. Even in the face of financial uncertainty, the School is convinced that it should build the Clinical Research Building and for several reasons. First, scientific research is moving in the directions emphasized in the Clinical Research Building and those directions make it compelling to have state-of-the-art facilities. Most of our peer institutions, similarly, are expanding their capacity to do biomedical research in these areas. Second, all capital funding for the building, \$53.8 million, has already been obtained. Third, the Clinical Research Building will also provide the facilities to bring the distinguished Howard Hughes Medical Institute to the University of Pennsylvania. The Institute's decision to locate at this Medical Center is predicated on access to "state-of-the-art" research facilities, which only the construction of new space can provide. And fourth, the School's leadership has confidence that the School will meet the building's operating expenses. Should the economic environment remain hostile, however, the School's contingency plans call for large portions of the Anatomy-Chemistry Building to be decommissioned. Investigators in that building would be relocated to modern laboratory space in the new building and elsewhere in the Medical Center. The savings in operating costs from this move will cover the quantified risks.

A plan that anticipates a bleak future will ultimately guarantee that future. The School of Medicine is an outstanding institution because it has invested in those resources—faculty and facilities—that enable it to fulfill and enhance its educational, research, and clinical services missions. Today, the School finds itself in the fortunate position of having the resources to construct modern state-of-the-art facilities that will enable it to maintain its great traditions of pioneering research at the frontiers of science. Currently only 20 institutions attract 50 percent of NIH extramural funding. The School is currently seventh among the top institutions in that 20. The School and University cannot afford to fall behind if we wish to remain a modern research university medical center.

The School of Medicine recognizes the risks posed by changes in the biomedical and health care delivery environments and is committed to continual striving for excellence. The next five years will be a period of formidable and complex challenges, but the School is prepared—as it has been for over 220 years—to be a leader in American medical education.

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