Biomedicine in the Twentieth Century: Practices, Policies, and Politics
Disease Categories and Scientific Disciplines: Reorganizing the NIH Intramural Program, 1945-1960

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In the summer of 1986, the United States Congress designated fiscal year 1987 as the “National Institutes of Health Centennial Year” in order to observe the agency’s anniversary with appropriate ceremonies and activities. President Ronald Reagan accordingly proclaimed: “The National Institutes of Health, which began as a one-room laboratory at the Marine Hospital on Staten Island in 1887, has become the world’s foremost biomedical research center. Its investigators are at the forefront of discoveries that contribute to better health for mankind.”¹ In addition to investigations conducted in the National Institutes of Health’s (NIH) own “intramural” laboratories, Reagan also noted the importance of the agency’s “extramural” program in supporting the activities of non-federal scientists in universities, medical schools, and other research institutions. Indeed, no other federal agency supported more academic research and development (R&D) than the NIH, which had grown since its beginnings into a vast research complex encompassing twelve institutes and several divisions and centers with a hefty budget of $6 billion.²

The expansion of the NIH in its first hundred years is most visible in the agency’s changing organizational chart. The Hygienic Laboratory, as the one-room laboratory on Staten Island, New York, came to be called, was relocated to the nation’s capital in 1891. Subsequently, it moved to a new, separate building in 1904 and had four divisions established along the lines of scientific disciplines (the Divisions of Pathology and Bacteriology, Chemistry, Pharmacology, and Zoology)—the internal
structure reflecting the high status of science at the turn of the century within the public health and medical research communities. There was no change to this four-division structure for more than three decades, but it was during this critical period that an expanded role for the federal government in medical research was much considered and debated. As Victoria A. Harden aptly shows, the 1930 renaming of the Hygienic Laboratory as the National Institute of Health was an outcome of the prolonged legislative debates over this issue. By the time the NIH moved from downtown Washington, D.C. to the spacious Bethesda campus in 1939, its position as the research arm of the Public Health Service (PHS) was considerably strengthened with the addition of two new units—the Divisions of Industrial Hygiene and Public Health Methods. A further tweaking during World War II made the NIH an organization of eight components: one institute (the National Cancer Institute, which officially became part of the NIH in 1944); two divisions (Infectious Diseases and Physiology); and five laboratories (Biologics Control, Industrial Hygiene Research, Pathology, Chemistry, and Zoology). The postwar years, however, witnessed the reshuffling of these components and the creation of new institutes along the lines of disease categories, such as heart disease, mental health, arthritis, and allergy. Hence, it has been the National Institutes of Health since 1948.

The origins of the “disease category” structure of the NIH and the ramifications of this for the postwar development of the biomedical sciences have not been fully explored in the history of science or the history of medicine. In this paper I focus on the expansion of the NIH intramural program within the categorical framework, as I will be discussing the changing relationship between the NIH and the extramural community elsewhere. Each of the seven categorical institutes that constituted the NIH in the 1950s had a different experience in building its intramural program, depending on the existence of previous activities in that particular category within the NIH or the PHS and the level of congressional support for its growth. Unique as individual situations were, I show that there was a common goal among the categorical institutes at the NIH to establish a strong basic research program covering several scientific fields, even if their links to categorical missions might be neither direct nor transparent. It was each institute’s Associate Director in charge
Shaping the Cancer Program

Not all institutes had to build their intramural programs from scratch in the post-World War II years. A good example is the National Cancer Institute (NCI), which had maintained a remarkable degree of continuity since its establishment in 1937. Carl Voegtlin, the NCI’s first director, or
“Chief” as he was called at that time, was a pharmacologist-turned-cancer-researcher with a broad knowledge in the field. Voegtlin was in complete charge of the research activities of his intramural scientists, who were all assembled in one building after 1940, and yet he had no firm organizational pattern in mind. Instead, he preferred to see a series of multidisciplinary groups formed to tackle specific problems, with his senior scientists acting as temporary chairmen of the groups. Voegtlin placed great emphasis upon this flexible, team-oriented approach to cancer research where no predominant theories existed, but at the same time he had a subtle influence upon the direction of research by giving suggestions, not direct orders, backed up with the funds he could allocate.

Several research lines to which Voegtlin gave high priority included the biochemical characterization of tumor tissue, carcinogenesis in tissue culture, nutritional factors in tumor origin and growth, and studies of gastric cancer. He also chaired scientific conferences, held once a month or at his request, at which new findings and research plans were discussed. Occasionally, prominent speakers were invited to give a talk at these events. In addition, Voegtlin made it a rule that the intramural staff send their papers to the *Journal of the National Cancer Institute*, a new publication managed by the NCI and edited by himself.8

Upon his retirement in 1943, Voegtlin was succeeded by Roscoe R. Spencer, who had built strong credentials as a microbe hunter, especially for his heroic contribution to the development of a successful vaccine against Rocky Mountain spotted fever.9 But Spencer possessed a short résumé as a cancer researcher. As one of his colleagues observed, “His interests in cancer were primarily at a philosophical level, with cancer as an example of species adaptation in a multicellular organism.”10 Devoid of towering authority in cancer research, Spencer was not an effective administrator, either. Under his editorship, for example, the institute’s journal began to atrophy from a diminishing number of contributions, partly because of the war, and partly because of Spencer’s failure to force his staff to follow the publication rules set by his predecessor. Nor did he display political acumen. Spencer’s 1946 testimony before the House Appropriations Subcommittee, which was mistakenly construed as the NCI’s hesitancy in taking up an immensely expanded budget, did not earn him much trust from the Public Health Service’s senior officers or from...
powerful cancer research advocates. The next year Spencer was replaced by Leonard A. Scheele.

Scheele was a veteran PHS officer who had had experiences of serving as a quarantine officer, a state health officer, a special cancer fellow at the Memorial Hospital in New York, an officer-in-charge of the National Cancer Control Program, a chief of the Medical Division of Civilian Defense, and an assistant chief of the NCI before becoming its director in 1947. Scheele’s interests were not so much in cancer research per se as in cancer prevention and control. With his expertise more in administration than in bench work, Scheele made an important contribution by formalizing the internal structure of the NCI into three branches: the research branch, with six sections of biology, biochemistry, biophysics, chemotherapy, endocrinology, and pathology at Bethesda, and a seventh section of a combined laboratory-clinic unit in San Francisco; the research grants branch; and the cancer control branch. The research grants branch was de facto an administrative arm of the National Advisory Cancer Council, which dealt with NCI’s extramural programs and traditionally did not meddle with intramural affairs. The cancer control branch had a multifaceted mission of administering cancer grants to state health agencies, loaning radium to hospitals, and promoting cancer teaching programs in medical schools. These activities appeared foreign and suspect to most intramural scientists. They wondered: “Should public health activities be at the NIH, or at administrative bureaus related to state functions? Is the close proximity of such activities to research desirable, wishfully thus being able to translate the findings of research to practical application with least delay? What are the differences and similarities between research grants and control grants?” Indeed, the dilemma of locating the cancer control program and the intramural program side-by-side manifested itself later: the cancer control branch was abolished in 1957, and then made a comeback after the 1971 National Cancer Act.

Scheele appointed Harry Eagle, a noted microbiologist with a strong academic and public health background, as chief of the research branch. Eagle had been director of the Venereal Disease Research Laboratory and Laboratory of Experimental Therapeutics at the Johns Hopkins University for twenty years before entering the PHS during World
War II. At the NCI, Eagle’s influence was most noticeable in the development of a simplified, commercially applicable technique for preparing tissue cultures by modifying the complex *in vitro* procedures previously devised by NCI’s Wilton R. Earle and Johns Hopkins’s George Gey. Eagle was, however, too much of a bench scientist to stay in an administrative position, and too much of an outsider to deal with individualistic intramural scientists. After two years he decided to leave the NCI and continue to pursue his research interests at another institute of the NIH, the Microbiological Institute, where he later became chief of the Laboratory of Cell Biology.\[^{13}\]

It was widely believed that Jesse P. Greenstein, a biochemist who joined the NCI in 1937, had drawn up the blueprint for the seven scientific laboratories during Scheele’s reorganization. An author of the two-volume classic, *Biochemistry of Cancer*, with volumes published separately in 1948 and 1954, Greenstein led the field with great authority. “Greenstein may have become the director of the Institute, but preferred to retain his hands on his retorts rather than to get involved in the paper problems of others. Had he accepted [the position], the intramural program may have emerged much more structurally centralized and directed than it became under the benevolent laissez-faire of J. R. Heller,”\[^{14}\] recalled one of his colleagues.

In 1948 John R. Heller was selected as director of the NCI by Scheele, who had just been appointed the Surgeon General of the Public Health Service. Like his predecessor, Heller was a veteran commissioned officer having spent most of his career in the PHS’s Venereal Disease Division, of which he served as chief. Heller was known as a skilled administrator, but had little experience in cancer research. During his twelve-year tenure as the NCI director, Heller seldom made important decisions or presented controversial opinions on scientific subjects by himself, always following the advice of his trusted intramural staff. In 1952, he successfully lured away G. Burroughs Mider from the University of Rochester to fill the position of chief of the research branch. This position had been newly upgraded, and its occupant was renamed the NCI’s Associate Director in charge of research. By that time, the term “Scientific Director” had been used NIH-wide for a person in that capacity.
Mider was no stranger to the NCI. He first came in 1939 as a research fellow and stayed for two years before taking a faculty position at Cornell Medical College. He also spent a year at the University of Virginia, and from there he moved to the University of Rochester as professor of cancer research and research associate in surgery. While maintaining the overall internal structure of the NCI, Mider modified the laboratory research part to strengthen clinical research and provide patient care before the opening of the Clinical Center in 1953. He created two new branches: the research medicine branch composed of sections of endocrinology, environmental cancer, and nutrition and metabolism; and the clinical medicine and surgery branch, which had sections of surgery, medicine, and clinical chemotherapy. His approach to cancer research was well expressed in the 1952 NCI annual report: “The research program of the National Cancer Institute must continue to be comprehensive. It must take advantage of each advance in science and technology. It must be integrated with the total effort in cancer research throughout the world but retain sufficient flexibility to make possible the shift in emphasis from one area to another as the need arises.”

Mider constantly pursued a balanced expansion of both scientific and clinical cancer programs in the 1950s.

Old Programs in a New Organization

To some old-timers at the NIH, it was perplexing that diseases as amorphous as arthritis and metabolic disorders could be packaged together and assigned to an institute that had a tradition of conducting a broad array of basic research. To others, it was ironical that the microbiology program with a long history of studying and combating infectious diseases became the last, among the seven institutes of the NIH in the 1950s, to adopt a title bearing the names of diseases. The National Institute of Arthritis and Metabolic Diseases (NIAMD) and the National Institute of Allergy and Infectious Diseases (NIAID)—the direct descendants of research programs from the time of the Hygienic Laboratory—did not have to build whole new sets of intramural research programs. The main problem for the two institutes was rather of an administrative nature: how to reinterpret the mission of each individual
laboratory in the light of new categorical mandates, and how to foster
the unity between old, laboratory-oriented programs and new, clinically
oriented ones.

The decision to create the National Institute of Arthritis and Meta-
bolic Diseases was part of a compromise made in the postwar years
between voluntary health organizations lobbying for the creation of
separate institutes in major disease categories and the Public Health
Service opposing the proliferation of an unmanageable number of
categorical institutes on campus. The deal, mediated by legislators in
Congress, was written in August 1950 as the Omnibus Medical Research
Act. It granted the Surgeon General discretion to create new institutes.
Though born with a disease-oriented mission, the NIAMD embarked
upon its intramural program with four science-oriented laboratories
(the Laboratories of Chemistry, Biochemistry and Nutrition, Physical
Biology, and Pathology). These laboratories had been constituents of
the Experimental Biology and Medicine Institute (EBMI), a short-lived
institute that might have been called “the Institute of Basic Medical
Sciences” at the time of its inception in 1947.16

The man who presided over the transition from the EBMI to the
NIAMD was William Henry Sebrell, Jr. An expert in nutritional studies
of diseases at the NIH for decades, Sebrell demonstrated a skill for
research administration and a sense of research politics. He served as
director of the EBMI for three years, became the NIAMD’s first director,
and, subsequently, took over directorship of the entire NIH in October
1950. Sebrell’s successor at the NIAMD was Russell M. Wilder, an
internationally renowned nutritional researcher from the Mayo Clinic
and Foundation. Wilder took the lead in creating a clinical research pro-
gram oriented toward specific disease problems, ranging from arthritis
and rheumatism to diabetes, endocrine disorders, and other metabolic
diseases. Because of ill health, Wilder resigned in June 1953 and was
succeeded by Floyd S. Daft, an organic chemist-turned-biochemist who
had served as the NIAMD’s assistant director of basic research.17

The reorientation of the basic research program proceeded at a gradu-
al pace, but not without anxieties. Claude Hudson, the face of the NIH’s
chemistry program for more than two decades, announced his retirement
in 1951, and Paul A. Neal, chief of the Laboratory of Physical Biology,
followed suit. There were also several major losses among young scientists, including Arthur Kornberg, who left to become head of the Department of Microbiology at Washington University School of Medicine in St. Louis. To a certain degree, turnover of scientific staff was simply a part of the natural process of senior members retiring and junior ones leaving for better jobs, but there was also a considerable amount of apprehension over the changes underway in the NIAMD. Kornberg, for instance, could not help having the impression that “the advent of the Clinical Center and the disease-oriented institutes would stifle basic research at NIH.”

For this reason, it was crucial for Daft to recruit someone as scientific director of the institute who could provide strong intellectual leadership for both scientists and clinicians and foster a sense of togetherness among the intramural staff members. In 1954, after about a year of searching, Daft finally appointed DeWitt Stetten, Jr., as the NIAMD’s Scientific Director. Having an M.D. and a Ph.D. from Columbia University, Stetten had built a distinguished career as a biochemist, especially in the study of gout, and he was also a medical educator who had written a textbook in biochemistry and taught the subject at Columbia and Harvard. Stetten appreciated the value of a multidisciplinary approach to the problems of diseases, but put strong emphasis upon a researcher’s freedom to choose his or her own topic. “A continuing problem with the scientific direction of an institute such as NIAMD,” he wrote in the 1956 annual report, “is the degree to which it is profitable to try to influence the choice of problems by our scientists.” He then argued:

Certainly the direction of the program can be influenced in the selection of new staff members to fill vacancies created either by new positions or by the departure of present staff. Also it is possible, by the distribution of support among the several laboratories, to enhance the production in an area where this seems desirable. It appears highly probable, however, that per research dollar spent, the greatest return will be secured if the mature scientist is allowed and encouraged to select the problems on which he will work. It is our belief that the meritorious and experienced investigator will in
general be the wisest judge of his field of endeavor. The most important function of the Scientific Directors therefore, is in the selection of senior scientists, in their encouragement, and in the attempt to procure for them those facilities which they may require for the fulfillment of their mission.\textsuperscript{20}

Articulate and persuasive, Stetten emerged as the champion of elitism and minimalism in research administration within the circle of the Scientific Directors at the NIH.

In the meantime, another set of old programs—the Division of Infectious Diseases, the Division of Tropical Diseases, the Biologics Control Laboratory, and the Rocky Mountain Laboratory—were joined together in 1948 in the newly created Microbiological Institute. This institute was renamed four years later as the National Microbiological Institute (NMI), which then became the National Institute of Allergy and Infectious Diseases in 1955.\textsuperscript{21} The NIAID had some difficulties from the beginning, because the advances in prevention and treatment of infectious diseases, marked by the development of antibiotics during World War II, precipitated a decline in public concern about such diseases and a change in funding patterns for research. Between 1948 and 1954, in fact, the study of infectious diseases had dropped from first to eighth place in terms of federal and private funding for medical research.\textsuperscript{22} A chart was also circulated at that time among policy makers and health reformers in order to illustrate dramatic changes in the death rates for various diseases in the past decades. “I recall becoming terribly annoyed at a chart,” said a former director of the NIAID, “that was proposed for showing to some influential group—I don’t know whether it was Congress or another group—which showed the death rates for cancer and heart disease going up steeply and the death rate for infectious disease going down sharply. I think I got it stopped all right, but . . . it took quite an effort to get people to think of infectious diseases as still a serious health problem.”\textsuperscript{23}

In this context, the title change in 1955 was a significant event for the NIAID. It meant an end to several years of frustration with congressional indifference and the lack of direction for future developments. For instance, the Microbiological Institute had an extramural program
Commentary on the intramural program in 1951 to administer two million dollars in research grants and fellowships, but no advisory council of its own was assembled to review grant applications and set institutional policies. The Surgeon General’s National Health Advisory Council assumed this role until 1956, and this arrangement opened the door for the NIH Director and other senior officers of the PHS to influence the process of research planning from the start. The National Microbiological Institute’s director, Victor H. Haas, did not exert much influence upon the intramural program, either, as the institute’s four constituent research units had been pursuing well-defined research missions of their own for decades. Having previously served as a medical officer in charge of the PHS’s malaria investigations, Haas conformed to the existing structure and authority, rather than shaking things up. He also had to fight an uphill battle in Congress. Between 1952 and 1955, the level of extramural funding for the NMI was almost flat (around $2 million), and there was no substantial budget increase for the intramural program ($3–4 million), except the portion for the creation of a new clinical program under the Laboratory

Figure 2. Mortality of major diseases between 1900 and 1950.

of Clinical Investigation. In other areas, the expansion of promising programs or the initiation of new activities took place only by curtailment or abandonment of less promising or unproductive projects.\textsuperscript{24}

Although not as imposing a director as he might have been, Haas quietly pursued some changes within the boundaries of financial and administrative constraints. He understood that the greatest strength of the institute was its ability to redirect research in response to new problems or new research opportunities, and a record of successful instances of this flexibility is well documented. For example, Q fever investigations were replaced by studies on the Coxsackie viruses, which in turn were changed to a respiratory virus project. Also, a pertussis study became modified to include Q fever epidemiology, the epidemiology of minor illness, and influenza vaccine evaluation.\textsuperscript{25} Haas and his research staff identified several new areas of investigation, such as allergic disorders, which afflicted a large number of the population. Haas reported in 1955: “Using presently available personnel and physical resources of the intramural operation, it would be practicable to reorient certain current projects so that there would be a more definite relationship to immunology and particularly allergy than is presently provided for. Some reorientation of this nature could be done in each of the Institute’s major Laboratories, including the clinical operation.”\textsuperscript{26}

It is difficult to determine how much the decision to strengthen allergy research was affected either by pressure groups and concerned legislators, or by the Surgeon General and his advisors, or by Haas and his NMI researchers. But the consequences were clear. In June 1955, the Laboratory of Biologics Control was taken out of the NMI and elevated to the status of the Division of Biologics Standards, and the NMI was renamed as the NIAID in December. The next year, the National Advisory Allergy and Infectious Diseases Council was formed. Dorland J. Davis, formerly chief of the Laboratory of Infectious Diseases, was appointed to be Scientific Director of the institute, and Congress nearly doubled NIAID appropriations for fiscal 1957 to $13.3 million. Davis was excited as he described the upcoming changes in the 1956 annual report: “The increasing interest and responsibility for advancing knowledge in basic immunology, hypersensitivity phenomenon, and allergy, as reflected in the recent change of Institute name, were
implemented by plans to coordinate existing intramural investigations in these fields and to supplement them with new studies.” “The beginning of this permanent program,” he also said optimistically, “is being made by concentration on the laboratory and basic aspects of immunology with the intention to expand into clinical investigation as promising leads develop, investigators conceive original projects, and facilities become available.” A few more laboratories, including the Laboratory of Immunology, were established in the late 1950s, and, by then, the NIAID had caught up with other categorical institutes in terms of connecting itself with the general public while conducting and supporting a broad spectrum of basic and clinical research.

James A. Shannon’s Wartime Experience

The National Heart Institute (NHI), established in 1948, was faced with a different set of problems in forming its intramural program. In the first place, the NHI inherited only a small group of research programs scattered around the Public Health Service. One of the NHI’s programs was a research unit on cardiovascular diseases, which had been in operation since 1931 and became part of the NIH’s Division of Infectious Diseases in 1937. This unit conducted clinical and laboratory studies on the origins of rheumatic fever at hospitals in Washington, D.C., and also carried out epidemiological studies on heart-disease mortality around the country, but its activities were severely curtailed during World War II. Another research unit in operation was a gerontology clinic located at the Baltimore City Hospitals, the institution that became part of the NIH’s Division of Physiology during the war. A third research unit was the Heart Disease Epidemiology Study at Framingham, Massachusetts. It had been established in 1948 as a field station of the Bureau of State Services of the PHS. In 1948-1949, these research units were transferred to the NHI, but there was still the daunting task of building laboratory-based research programs. Cassius J. Van Slyke, the appointee as director of the NHI, did not seem the ideal person for this job. He was a career PHS officer who had worked on the experimental study of venereal diseases and subsequently made a key contribution to the administration of research grants as chief of the
Division of Research Grants. A large portion of Van Slyke’s time was also spent in drawing up general policies for the NHI’s grant and fellowship program with the members of the National Advisory Heart Council. It took a combined effort of the NIH’s Director and Associate Director, i.e., Rolla E. Dyer and Norman Topping, to find a man to construct the intramural program of the Heart Institute from planning to staffing. They were finally able to persuade James A. Shannon, then director of the research institute of the pharmaceutical company, E. R. Squibb & Sons, in New Jersey, to take the position of the NHI’s Scientific Director in 1949.30

Shannon was not a specialist in heart diseases. He was an authority in renal physiology, best known for the development of accurate methods for measuring the glomerular filtration rate in the kidneys.31 For such a scientifically ill-defined field as the study of heart disease, however, his broad knowledge and administrative experience were deemed to matter the most. Shannon had received his M.D. and Ph.D. from New York University and served on the faculty of its department of physiology and medicine. In 1941, he assumed the responsibility of directing the NYU Research Service at Goldwater Memorial Hospital, where he formed a team of researchers in renal physiology to work back and forth between their laboratories and the patient beds.32 But then Shannon’s group turned its focus to the development of antimalarial drugs as part of the military-civilian coordination of malaria research, and also because Shannon chaired the National Research Council’s panel for clinical trials of new drugs.33

The wartime experience at Goldwater significantly changed Shannon’s perception of the federal role in medical research. First and foremost, Shannon realized that he had the possibility of being able to lead organized research with almost unlimited resources while not having to restrict too much the spirit of freedom in the research of the scientists. He had no reservations about working for the NIH. As he later recalled: “It was new. No one had been there before, and I inherited no sins.”34 After a few months in office, Shannon developed a three-layered structure for the NHI’s intramural program—laboratories for basic science, clinics for patient care, and combined laboratory and clinical sections35—drawing on the wartime malaria project that had coordinated a variety of research done by organic chemists, pharmacologists, physiologists, and clinicians.36
Yet to persuade top-quality scientists to forsake their academic careers and join government laboratories was no simple matter. First, Shannon began to contact his former colleagues at Goldwater, who universally admired his leadership.37 “All he had to do was whistle, and people came running,” one of his Goldwater associates recalled but, in reality, Shannon had to convince these colleagues that they would be able to cut through government red tape. Robert Berliner, Bernard B. “Steve” Brodie, Robert Bowman, and Sidney Udenfriend, all of whom had set their career paths in academia, eventually became his staff again. Shannon also searched for scientific talent through the so-called “old boys’ network” of department chairmen and deans of medical schools. One of his greatest catches was Christian B. Anfinsen, assistant professor of biological chemistry at Harvard Medical School, who had also been involved in the wartime malaria project. Shannon’s recruits also included Evan C. Horning, an organic chemist at the University of Pennsylvania; Bert R. Boone, a developer of the electrocardiograph at Temple University Medical School; and Luther L. Terry, assistant professor at the Johns Hopkins University School of Medicine. Shannon penciled in Stanley J. Sarnoff, associate professor of physiology at Harvard, and Eugene Braunwald, a recently minted M.D. from NYU, as his main targets for the Laboratory of Cardiovascular Hemodynamics. He also persuaded Andrew G. Morrow, a young faculty member at Johns Hopkins, to take

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*Titles of research units in this category start with “The Laboratory of.”
up the cardiovascular surgery clinic. By the time Shannon decided to move to the Office of the Director of the NIH in 1952 as Associate Director for Intramural Research, the intramural program of the National Heart Institute had been placed on a solid basis.39

The Joint Intramural Program

The formation of the intramural programs of two other institutes—the National Institute of Mental Health (NIMH) and the National Institute of Neurological Diseases and Blindness (NINDB)—bore a striking resemblance to that of the National Heart Institute’s, although the two institutes were confronted with extraordinary circumstances.40 The NIMH had to endure a three-year ordeal of being authorized but not officially established until 1949 because of the lack of appropriations. In addition, the institute’s visibly community-oriented function of providing social services and training mental health workers gave ample reason for critics to doubt whether or not the NIH would be a better home for it than any of the other bureaus of the Public Health Service. Most important, there was a great deal of skepticism about the scientific nature of mental health research that would include behavioral and social sciences. Robert H. Felix, who had led the way to the creation of the institute and served as its first director, recalled: “This wasn’t the most friendly climate. . . . I got nothing but misunderstanding. . . . We weren’t respectable. Clinical research in psychiatry wasn’t even research. There wasn’t any basic research going on. We weren’t doing any physiology, or chemistry and so forth.”41 The NINDB encountered a similar situation. Though established in 1950, the NINDB received no direct appropriations earmarked for its extramural and intramural programs for three years. Nor did it have a director until October 1951 when Pearce Bailey was recruited from the neurology program of the Veterans Administration. Bailey managed to initiate programs, one by one, with a budget given as part of the NIH Director’s operating expenses. Characterized as “the first cause of permanent crippling and the third cause of death,” neurological diseases and sensory disorders drew much attention from concerned citizens and health organizations, but there were only a handful of schools that offered specialized training in this field.42
After spending a few years searching for someone to build the NIMH intramural program, Felix finally could make an offer to Seymour S. Kety, professor of clinical physiology at the University of Pennsylvania. A rising star in the physiological study of blood flow and energy metabolism in the human brain, Kety was understandably uncertain about whether physiologists, not psychiatrists, could thrive in a government institute specifically targeted towards mental illness. Felix then made a strong sales pitch to him: “I am a psychiatrist, not a scientist. You are the scientist. You will have free range to hire staff, an unrestricted budget, and beds in the new Clinical Center, scheduled to open in 1953.” The unique opportunity to direct the research program of what Felix believed would be “the greatest institution for the study of the brain and behavior that the world has ever seen,” the deep pockets of the federal government, and the strong assurance of research freedom to conduct multidisciplinary studies were prospects too enticing to pass up. Kety accepted the offer in May 1951 and became the NIMH’s Scientific Director. Not long after that, the range of Kety’s authority was further expanded to the NINDB, as the two directors, Felix and Bailey, made a tactical decision to pool their resources to develop a joint basic research program. Aside from providing a practical benefit for the slow-starting NINDB, the two men purported to see synergistic effects that could come from combining basic research in neurological and mental diseases.

Kety was truly the James Shannon of the NIMH and the NINDB. He spent several months drawing up a blueprint for this joint venture, mostly along the lines of scientific disciplines, not specific diseases, and then embarked upon an intensive recruiting campaign, heavily tilted toward scientists in the universities but also open to researchers in the military services and the PHS. The nine-laboratory structure Kety proposed in late 1952 clearly revealed his vision of a balanced, multidisciplinary approach, covering the broad areas of biological, behavioral, and clinical exploration: biophysics, biochemistry, neurophysiology, pharmacology, anatomical sciences, experimental neuropathology, experimental psychology, epidemiology, and socio-environmental studies. The laboratories would be comprised of two to four sections, which represented further specialized fields (endocrinology, cellular pharmacology, etc.), specific body parts or functions (spinal cord, vision and
special senses, etc.), and other categories (community studies, animal behavior, etc.).

The laboratories that had their roots in the PHS’s Division of Mental Hygiene or the NIH’s other institutes, such as the Laboratory of Neurophysiology and the Laboratory of Socio-Environmental Studies, were established immediately, but the others had to go through the arduous process of staffing, especially that of recruiting laboratory chiefs among top-class scientists. Like Shannon, Kety was confronted with academic prejudice against the federal research establishment, and again like Shannon, he could only offer exceptionally high salaries for a limited number of scientists, a promise of research freedom, and the excitement of working in a brand-new institute without having to worry about writing grant proposals. By the time Kety stepped down in 1956 to return to his bench work, the joint NIMH-NINDB intramural basic research program had taken the form of eight laboratories and one field station (the Addiction Research Center), a slight alteration from his original plan. This joint program continued for four more years before eventually being split into two in 1960.45

In parallel to the laboratory-oriented basic research program jointly developed by the NIMH and the NINDB, the two institutes’ patient-oriented clinical research programs began to take shape. Felix asked Robert A. Cohen, the clinical director of Chestnut Lodge, a small psychoanalytic hospital in Maryland, to join the NIMH to take charge of its clinical research program. A holder of the dual degrees of M.D. and Ph.D. (in neurophysiology), Cohen had previously had a long career of working for the federal government as a medical officer of the U.S. Naval Reserve during World War II. He was a consultant in psychiatry to the National Naval Medical Center, and a member of the Panel on Human Relations and Morale of the Department of Defense, but nonetheless he had reservations about accepting Felix’s offer. Like Kety, however, Cohen was sold on the unprecedented opportunity he would have to craft a clinical research program from the beginning. By 1958, under his guidance, the NIMH program had grown to have three clinical branches, three laboratories that were integrated with Kety’s joint program, five wards in the Clinical Center, a children’s residential treatment center, and a center at St. Elizabeths Hospital.46 In the meantime, Bailey
tapped alumni of the Montreal Neurological Institute, one of the well-known training grounds for neurologists, to fill the key positions in the NINDB’s clinical research program, including G. Milton Shy, who was appointed as the clinical director and at the same time as chief of one of the program’s four branches. Eventually, Shy became the Scientific Director of the NINDB after its joint basic research program with the NIMH was dissolved.47

Space, Money, and Image: Conundrums of Dental Research

As has been described, each institute had to cope with the opportunities and challenges presented in various contexts during its formative years. But none had experienced the kind of problems that the National Institute of Dental Research (NIDR) encountered. For about ten years after its establishment in 1948, the NIDR struggled not only to find the space to house its researchers, but also to secure the funds for both its intramural and extramural programs and to overcome prejudices against dental research among many medical researchers. This decade was a crucial period in which the NIDR had to survive and became recognized as a legitimate member of the NIH community.

Almost from the start, the NIDR’s position in leading the nation’s dental health research effort was precarious, because there were two other competing divisions within the Public Health Service: the Division of Dental Public Health (in the Bureau of State Services) and the Division of Dental Resources (in the Bureau of Medical Services). These divisions were primarily charged with traditional public health duties, such as providing education on dental health, training health workers, and treating patients in federal or local facilities. However, they were also involved in research projects like the study of the effects of fluoride on the development of dental caries, and their relation to the NIDR was further complicated because of ambiguity in the 1948 National Dental Research Act as to whether dental research appropriations should be used exclusively for the NIDR or for all the dental health programs of the PHS. NIH director Rolla E. Dyer wanted to separate the NIDR’s research activities from the PHS’s control and treatment programs as much
as possible, but he thought that, given the overlapping functions of the
new institute and the two divisions, it would be more practical to receive
appropriations for all the dental programs and then allocate specific
funds to the NIDR. Surgeon General Scheele accepted Dyer’s recommend-
ations. It was thus the PHS chief dental officer, not the NIDR
director, who had the responsibility for reporting the nation’s dental
health activities to Congress and discussing the proposed budget with
legislators. This situation continued until 1960 when the House Appropri-
ations Committee allowed the NIDR to submit a separate budget.48

The extramural program of the NIDR was set in motion in 1949
immediately with the formation of the National Advisory Dental Research
Council, which was composed of dental experts and lay advocates. For
its intramural program, there was already a core research group of less
than a dozen investigators at the NIH, mostly in the section on dental
research in the Laboratory of Physiology of the Experimental Biology
and Medicine Institute. The chief of the group was H. Trendley Dean, a
commissioned officer who had led dental research at the NIH since 1931
and had been one of the prime movers for the creation of the NIDR.
It was thus no surprise that Dean was appointed as the NIDR’s first
director. Dean was actively engaged in recruiting additional staff mem-
ers and tweaking the overall structure of the program along the lines of
laboratory research and clinical research, a pattern commonly adopted at
the NIH. On the side of laboratory research, he established sections on
oral biochemistry, oral bacteriology, functional morphology, and epide-
miology; and on the clinical side, he planned to create sections for dental
and periodontal diseases, dental equipment and materials, and growth
and development.49

But the thorny question was the location of these programs. Dyer
insisted that the NIDR should be located on the grounds of the Bethesda
campus as an integral part of the NIH. One option was to house the NIDR
research staff either in the future Clinical Center or in a space vacated
by other institutes. This idea was rejected by Dean and other senior staff
of the NIDR who favored the other option of constructing a separate
new building for dental research, as authorized by the 1948 National
Dental Research Act. It took ten years to get the construction bill signed
into law, however, and the ordeal finally ended with the opening of a new
building for dental research in 1961. Until that time, the NIDR’s intramural program was dispersed in various places: some of the research work stayed in Bethesda, but other sections had to be carried out at field stations, including one at the PHS Hospital on Staten Island, New York, and another at the Eastman Dental Dispensary of Rochester, New York. The NIDR also maintained an office at Grand Rapids, Michigan, in connection with the water fluoridation studies. A 1955 report clearly indicated the acute space problem:

By being an integral part of the National Institutes of Health, this Institute has access to exceptional research facilities and consultive services which could not be provided otherwise. The scope of the research program of the Institute allows the widest range of scientific freedom to its staff. The only detrimental aspect of the environment is the lack of adequate laboratory space which handicaps activities in several important research areas.50

The inadequate laboratory space was not the only major problem. The level of funding for the NIDR, always the lowest within the NIH, reflected both the lack of congressional support and the shortage of dental researchers.51 The NIDR’s funding situation was much relieved when it received $6 million in appropriations for fiscal year 1957, including $3.7 million for grants and fellowships. This was a quantum leap from the half million dollars appropriated in the previous year for these budget items. It was the first time that the amount of extramural funding exceeded that of intramural funding for the NIDR.52

The NIDR’s third major problem was staffing. Recruiting top-class senior scientists or young talent required special efforts by all institutes, but the NIDR was faced with a unique situation. First, few graduates from dental schools elected research or teaching careers. Very little basic research was taught and conducted in dental schools, and fellowships and scholarships to support graduate education for research careers were generally few. The recruitment of non-dental scientific personnel was not easy, either. “Too few persons who prepare for research careers in the basic sciences ever consider dental research,” the NIDR recognized in a 1955 report. “This may be attributed to many factors, such as the feeble
emotional appeal of dental diseases, the usual lack of on-the-campus communication between graduate schools and dental schools, the general knowledge that funds for the support of dental research are hard to get and that research-teaching positions on dental school staffs are very limited.” 

Although the situation was gradually improving in the fellowship area, thanks to the NIDR’s extramural program, finding investigators competent in fields of clinical research (namely, those who had graduate training in basic sciences and had received specialty training after graduation) was further complicated by the enormous salary disparity between dental researchers and practitioners.

Under these circumstances, the appointment of Seymour J. Kreshover as the Scientific Director of the NIDR in 1956 was especially noteworthy. A holder of three doctoral degrees—a D.D.S. from the University of Pennsylvania School of Dentistry, a Ph.D. in clinical medicine and pathology from Yale University, and an M.D. from New York University School of Medicine—Kreshover had impressive research credentials in the fields of oral pathology and embryology and congenital malformations.

Not only was he able to reinvigorate the intramural program with his enthusiasm, but he also helped to upgrade the general image of dental research within the NIH community. “In the relatively brief span of 12 years since the establishment of the National Institute of Dental Research, the unfolding pattern of program activities has been characterized, perhaps most significantly, by a redefinition of dentistry’s scope of research,” he said in the 1960 annual review of the program. To Kreshover, the intellectual hierarchy or barrier between dental research and other scientific and medical research should be abolished. He argued:

With early emphasis directed toward the development, on a foundation of existing scientific knowledge, of a rational basis for understanding the natural history of the teeth and their supporting structures in health and disease, there rapidly evolved an era of unprecedented productivity. Today’s assets may be measured, in part, by the removal of much of the artificial but traditionally structured separation of dental research from the total body of the biological and medical sciences. With this accomplishment has come new breadth,
new responsibility, and new meaning to dental research. How better to herald this new era of understanding than not, without a raising of eyebrows, the essentially unchanged direction and significance of a scientist’s research program as he moves organizationally to or from one of the other categorical Institutes of the NIH.\textsuperscript{55}

Kreshover’s remarks reflected the new opportunities that had opened for dental research. Like medical research on other body parts or physiological functions, dental research became perceived as firmly grounded on scientific reasoning and methodology. There was no longer the need to attach “oral” to the titles of laboratories and branches, as is revealed in the 1960 organizational chart of the NIDR intramural program. They were now the Laboratory of Biochemistry, the Laboratory of Microbiology, the Laboratory of Histology and Pathology, the Epidemiology and Biometry Branch, and the Clinical Investigations Branch. One has to look at the titles of sections to find such terms as “dental caries” and “calcification.” Otherwise, it is almost impossible to tell whether these laboratories and branches belonged to the NIDR or to other categorical institutes.

The Dual Structure of the NIH Intramural Program

Kreshover’s observation on the personnel movement across categorical institutes, i.e., along disciplinary lines, indicated the existence of the disciplinary structure in operation within the categorical one. This dual structure—formally categorical but informally disciplinary—was developed as a distinct feature of the NIH intramural program. The idea of creating a new institute devoted to a specific discipline, such as an Institute of Biochemistry, was still floating but not warmly received. Sebrell, the NIH Director from 1950 to 1955, recalled discussions on how to structure research on the Bethesda campus. “One approach envisioned a large autonomous organization in biochemistry, housed in one building, that would serve all the Institutes,” he said. “And there was a great deal of argument for this—greater interchange of information, closer association, and so on. What we finally adopted was the opposite: every Institute having its own laboratory of biochemistry. I never felt any unhappiness with this.”\textsuperscript{56}
A similar proposal was submitted in the late 1950s to create an Institute of Physical Biology, one that would house state-of-the-art physical instruments in one building and provide services for other institutes. Stetten, the NIAMD’s Scientific Director, was the man behind this idea, which did not materialize because of the lack of appropriations for the construction of such a building.\footnote{It was a hard sell in Congress.} On the contrary, the benefits of housing different disciplines in one categorical institute were obvious in terms of funding expediencies. But there were other reasons, as Sebrell pointed out:

I think it would have been a mistake had we created disciplinary institutes, and I was very happy to see the categorical programs go ahead on their own with independent biochemical research units in several institutes. I think this was the way to do it: scientists working in the same general field, but with different ideas, different labs, a certain amount of independence and competition. If a biochemical Institute had been created, I think we would have had real troubles.\footnote{In a sense, the NIH intramural program was a microcosm of the whole biomedical enterprise that grew by leaps and bounds in the postwar context. The dual review system of the extramural program—one tier of review by study sections composed of specialists in research fields, and the other by advisory councils composed of specialists and laymen—was gradually put in place to deal with concerns about the potential conflict between the disciplinary organization of science and the categorical funding. The scientists were assured that their proposals would be reviewed by their peers, but at the same time they had to accept the new rules of the game by which societal needs would be seriously considered in research funding. At stake was the research freedom of individual investigators in the new era of federal funding for biomedical research. Where to draw the line between research freedom and research planning? How to steer the nation’s fast-growing biomedical research enterprise without encroaching upon the autonomy of universities and medical schools? Indeed, the extramural community faced the same kind of conundrum as its intramural counterpart did in understanding and handling the tension between the categorical mission and the scientific aims of research.}
Notes

I am deeply grateful to Victoria A. Harden for my intellectual and professional growth at the NIH. Alan N. Schechter has been a source of insightful perspectives on the NIH and NIH people, past and present. I also wish to express my thanks to Philip Chen, P. Boon Chuck, Caroline Hannaway, and Henry Metzger for their invaluable comments on earlier versions of this article.


2. The 1987 NIH obligation for academic R&D was $3.9 billion, more than a half of the total, $7.3 billion, for all federal agencies. In contrast, the National Science Foundation’s contribution was $1 billion. Daniel S. Greenberg, Science, Money, and Politics: Political Triumph and Ethical Erosion (Chicago: University of Chicago Press, 2001), Appendix, Table 4. For the study of the NIH around 1987, see Institute of Medicine, A Healthy Intramural Program: Structural Changes or Administrative Remedies? (Washington D.C.: National Academies Press, 1988).


5. Public Health Service, Annual Report of the Surgeon General of the Public Health Service of the United States for the Fiscal Year 1939 (Washington, D.C.: U.S. Government Printing Office, 1939). Among the four existing divisions, the larger Division of Pathology and Bacteriology was broken up into three smaller Divisions of Infectious Diseases, of Pathology, and of Biologics Control. The NIH was also responsible for administering the newly established National Cancer Institute.


7. This can be contrasted with the vast body of literature on the history of the physical sciences during the Cold War. For a general overview of the NIH’s transformation after World War II, see Harden, Inventing the NIH, epilogue; Daniel M. Fox, “The Politics of the NIH Extramural Program, 1937-1950,”


11. See David Cantor’s article in this volume.


15. Public Health Service, National Institutes of Health, Report for the Period July 1, 1951 to December 31, 1952 (NIH internal document), p. 4, NIH Library, Bethesda, Maryland. There is no specific indication as to who wrote this.
introductory statement for the part on laboratory research, although it was most likely written by G. Burroughs Mider. In later annual reports, however, the names of Scientific Directors appeared on such introductions.

16. Public Health Service, General Circular No. 12, “Establishment of the Experimental Biology and Medicine Institute in the National Institute of Health,” (11 December 1947), (Revised 8 October 1948), Record Group (RG) 443, Entry, Box 70, National Archives, College Park, Maryland. The Laboratory of Physical Biology was added in 1948 to the EBMI, which had originally been comprised of three units: the Division of Physiology, the Chemistry Laboratory, and the Pathology Laboratory. They were respectively renamed as the Laboratory of Biochemistry and Nutrition, the Laboratory of Chemistry and Chemotherapy, and the Laboratory of Pathology and Pharmacology. For the ideal of basic science at the time of the creation of the EBMI, see R. D. Lillie to Rolla E. Dyer (14 November 1947), RG 443, Entry, Box 70, National Archives.


18. Among others who left the NIH before 1955 were J. L. Strominger who took a Markle Scholarship (administered by Washington University School of Medicine in St. Louis); Elijah Adams who accepted an offer of an associate professorship at New York University School of Medicine; E. A. Hawk who left to direct clinical nutrition investigations for the Upjohn Company; George E. Daniel who accepted “a much more responsible and remunerative research position” with the Armed Forces; and James Peers who became head of the Department of Pathology at Loyola University, Chicago. See National Institutes of Health, “The Program of the National Institute of Arthritis and Metabolic Diseases,” Part V, a report submitted to the National Science Foundation Special Committee on Medical Research in 1955, MSC 419, Box 2, Folder 12, NLM.


21. Public Health Service, General Circular No. 55, “Establishment of the Microbiological Institute in the National Institutes of Health” (8 October 1948), RG 443, Entry, Box 70, National Archives. The three research units were renamed respectively as the Laboratory of Infectious Diseases, the Laboratory of Tropical Diseases and the Laboratory of Biologics Control. There was no name change for the Rocky Mountain Laboratory.


24. The Microbiological Institute was established by PHS Organization Order No. 20 of General Circular No. 55, effective 1 November 1948. This title was officially changed to the “National Microbiological Institute” on 30 March 1951, by Organization Order No. 29 of General Circular No. 51, Supplement 7, which was issued to restate the institutional mission encompassing the extramural as well as intramural programs. On the general overview of research activities and the budget situation of this institute up to 1955, see National Institutes of Health, “The Program of the National Microbiological Institute,” a report submitted to the National Science Foundation Special Committee on Medical Research, MSC 419, Box 3, Folder 10, NLM. On the years between 1950 and 1953, see Public Health Service, National Institutes of Health, Report for the Fiscal Year July 1, 1950 to June 30, 1951, pp. 109-46; Public Health Service, National Institutes of Health, Report for the Period July 1, 1951 to December 31, 1952, pp. 99-124.


26. Ibid., pp. 2-3. For the reasons why “allergy” was adopted instead of “immunology,” see Sheldon G. Cohen and William R. Duncan, “Immunology and NIAID, 1887-1970,” in National Institute of Allergy and Infectious Diseases, ed. Harriet R. Greenwald and Victoria A. Harden (Bethesda, Maryland: National Institutes of Health, 1987), pp. 82-84. Based on their personal communications with Hass, Cohen and Duncan wrote: “Instead, in the choice of allergy for the Institute’s new name, consideration was given to the scientific acceptability of this term within a global interpretation that would include the study of immune functions and disorders. At the same time, it would satisfy those who believed that NIH had lacked involvement with and concern for that large segment of the public afflicted by allergic disorders.”


30. For Van Slyke's biographical information, see National Institutes of Health, *NIH Almanac 1969*, p. 30. It was also Dyer and Topping who persuaded Van Slyke to take the directorship of the NHI. Topping recalled, “The first thing Van Slyke said was that the institute needed a Scientific Director.” Topping also said that he had known Shannon during the war for Shannon’s important role in malaria research, and that he began to court Shannon when they met at a scientific meeting in early 1949. Norman Topping, *Recollections* (Los Angeles: University of Southern California Press, 1990), pp. 104-5. For a sketchy, personal account of the history of the institute, see Ernestine Taylor Lanahan, *A Salute to the Past: A History of the National Heart, Lung, and Blood Institute Based on Personal Recollections* (Bethesda, Maryland: National Institutes of Health, 1987).


32. As the science writer Robert Kanigel has observed, “Goldwater was a preview of what he would do, on a larger scale, at the National Institutes of Health.” Robert Kanigel, *Apprentice to Genius: The Making of a Scientific Dynasty* (Baltimore, Maryland: Johns Hopkins University Press, 1993), p. 18.


39. For more information on how Shannon staffed the intramural program of the National Heart Institute, see Park, “Development of the Intramural Research Program.” pp. 391-94.
41. Robert Felix, “Oral History Interview,” by George Rosen, 8 February 1963, MSC 203, Box 1, Folder Felix, NLM, quoted in Farreras, et al., eds., *Mind, Brain, Body, and Behavior*, p. 10. See also Sebrell, “Oral History Interview,” pp. 145-46. Sebrell said: “Then, as the treatment of mental disease with drugs came along, Felix began to change. But the type of mental research they were doing for awhile in the Clinical Center did not appeal to me. Being the kind of research man I was, I didn’t call it research. They had a man who played a guitar for the little murderous children as a research project.”
45. On the formation of this joint program, see Farreras, et al., eds., *Mind, Brain, Body, and Behavior*, pp. 33-56.


47. The Montreal Neurological Institute, founded in 1934 at McGill University by the Rockefeller Foundation, the neurology program of the Veterans Administration, and the NINDB, filled the academic training gap during the early years of neurological studies, according to Donald B. Tower who was a section chief in Shy’s Medical Neurology Branch and would eventually become the institute director. See Donald B. Tower, “The 1950s Clinical Program at the NINDB,” in Farreras, et al., eds., *Mind, Brain, Body, and Behavior*, pp. 295-300; Tower, “Neurosciences–Basic and Clinical,” pp. 46-70.

48. The Public Health Service’s dental health organizations evolved over time. The 1944 PHS Reorganization Act consolidated the position of chief dental officer at the level of an assistant surgeon general in the PHS, and a section on dental health was established in the Bureau of State Services. In 1949 the function of this section was enlarged and divided into the Division of Dental Public Health and the Division of Dental Resources. In 1960, these two merged to form the Division of Dental Public Health and Resources. On the legislation of the National Dental Research Act, Dyer’s effort to make the new institute an integral part of the NIH, and the rivalry over dental research in the PHS, see Ruth Roy Harris, *Dental Science in a New Age: A History of the National Institute of Dental Research* (Rockville, Maryland: Montrose Press, 1989), chaps. 4 and 6.

49. For the laboratory research programs of the NIDR in the early 1950s, see Public Health Service, *National Institutes of Health, Report for the Period July 1, 1951 to December 31, 1952*, pp. 103-6. No clinical program was yet established.

50. National Institutes of Health, “The Program of the National Institute of Dental Research,” Part V, a report submitted to the National Science Foundation Special Committee on Medical Research, MSC 419, Box 3, Folder 1, NLM.

51. In 1955, the NCI would get $25 million; NHI $19 million; NIMH $18 million; NIAMD $11 million; NINDB $10 million; NMI (i.e., NIAID) $8 million; and NIDR $2 million. There was also $6 million appropriated for non-categorical general research and service activities. Dean, who retired in 1953 from the NIDR directorship, complained strongly to the National Science Foundation special committee investigating the administration of the NIH: “This disparaging amount, $2,136,000, does not even represent the amount expended by the National Institute of Dental Research for research. Included in this sum are the amounts spent by the Services’ dental
public health activities in the Bureau of State Services, and the amount spent by the Division of Dental Resources in the Bureau of Medical Services.” H. Trendley Dean to Joseph W. Pisani, 9 September 1955, MSC 419, Box 1, Folder 14, NLM. The NSF special committee recommended no major expansion of the NIH intramural program and no increase in the number of categorical institutes but agreed that, “in general, the present level of support of the intramural programs of all Institutes except those of Microbiology and of Dental Research is adequate.” Special Committee on Medical Research, “Medical Research Activities of the Department of Health, Education and Welfare,” December 1955, pp. 22-23, MSC 419, Box 1, Folder 1, NLM.

54. National Institutes of Health, *NIH Almanac 1969*, p. 49. In 1966, Kreshover was appointed director of the NIDR, succeeding Francis A. Arnold, Jr., who became the PHS’s chief dental officer.