70 Acres of Science

THE NIH MOVES TO BETHESDA

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Curator, The DeWitt Stetten, Jr., Museum of Medical Research

Office of NIH History
National Institutes of Health
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The National Institute of Health Moves to Bethesda

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INTRODUCTION

Some ebooks begin as classics of written text breaking their bonds of binding for the web; other ebooks are created for the web by technologically adept authors. This ebook began as a small physical exhibit of three cases in a hallway of the National Institutes of Health's (NIH) Clinical Center. The exhibit commemorated the NIH moving to its campus in Bethesda, Maryland, but was limited in space, exposure, and research materials. Most of the documents, articles, photographs, and instruments in this ebook were not available to scholars in the late 1980s.

After several years, during which the web developed and the physical exhibit was replaced with other exhibits, Dr. Victoria Harden, director of the Office of NIH History (ONH), decided that the exhibit should be available on the web. In the intervening years, staff had been added to the ONH and research resources made available that changed the scope of the project. Initially the project was conceived as a web exhibit which would include text, photographs, documents, and objects. This conception sank under the sheer weight of information available. So the project was reconceived as an ebook, with more text and fewer images. But the ebook still bears the mark of its origin as a web exhibit, with sections where photographs, instruments, and documents are the main topic. The organization of the ebook and its essays also reflect the ebook's beginnings as an exhibit.

I now walk the NIH campus picturing what it looked like as it was being built in the late 1930s. To my mind's eye, the scientists working behind the windows of the first six buildings are those luminaries of the past such as Charles Armstrong, Margaret Pittman, William Sebrell, and Claude Hudson to name just the tip of the iceberg. In his speech at the laying of the cornerstone of Building 1 on June 30, 1938, NIH director Lewis R. Thompson said, "I do not know of any other officer of my own times and I doubt if there will be many in the future to have the pleasure, excitement and good luck to be personally instrumental in the development of an institution such as the National Institute of Health now is in 1938." I believe he was right.

CHAPTER 1: ESTABLISHING THE NIH CAMPUS AT BETHESDA, 1930-1941

As one walks the grounds of the National Institutes of Health (NIH) in Bethesda, Maryland, one could mistake the setting for a college campus. Quaint red-brick halls and modern high-rises spring up between shade trees on grassy lawns, and young people stroll on the sidewalks. But the NIH is the biomedical research organization of the federal government. Why is a government agency located in Bethesda, apparently masquerading as a university? The simple answer is that in the late 1930s, the NIH needed more room and a wealthy couple donated some of their land. The more complex answer involves domestic politics, social reform, international relations, economic depression, scientific advances, and personal ambitions.

Some Background

The story begins with politics and scientific progress leading to an accretion of duties for a one-man laboratory. In 1887, the Public Health Service (PHS) established a small laboratory in a room of the immigration quarantine facilities in New York. There Dr. Joseph Kinyoun was to bring the new discipline of bacteriology to bear on disease research relating to the examination of immigrants. Kinyoun identified the bacterium that caused cholera, providing a diagnostic tool for PHS physicians.

In 1891, the "Hygienic Laboratory" moved to Washington, D.C. where Kinyoun's duties expanded to include training PHS officers in laboratory methods and conducting water and air pollution tests. Ten years later, Congress authorized construction of an entire building for laboratory research into infectious diseases at 25th and E Streets, NW. The next year, 1902, Congress again increased the Hygienic Laboratory's responsibility, adding the regulation and licensing of commercially produced serums and vaccines–treatments which were becoming increasingly popular. Non-infectious diseases were added to the Laboratory's mandate in 1912. To accommodate these new responsibilities, a second building was constructed in 1919 at 25th and E Streets, NW.

Building at 25th and E Streets, NW
Office of NIH History

Senator Joseph E. Ransdell
Office of NIH History

Birth of the National Institute of Health

Although it had grown from a one-room laboratory investigating the diseases of immigrants into a complex of laboratories concerned with infectious and non-infectious diseases (basically all diseases) and regulating treatments, the Hygienic Laboratory remained an arm of the PHS funded by appropriation bills. Senator Joseph E. Ransdell (Louisiana) declared "Our lagging in the matter of medical research has not been the result of the inefficient mentality of our scientists, but, on the contrary, the lack of facilities and the discouraging insufficiency of funds to stimulate recruits in science" ("The War for Health," *The Washington Evening Star*, May 26, 1931, page A-8). Ransdell introduced a bill to rectify this situation. The bill would rename the Hygienic Laboratory, establishing it as "The National Institute of Health," with its own $15 million appropriation for operations.

The name change was an important psychological and political device. It sent the message that the agency was an organization instead of just a laboratory, and that its mandate was anything to do with health. While the National Institute of Health (NIH) would still be overseen by the PHS, its new name suggested that it was in service of the United States as a whole and implied a role for government in maintaining the public's health. "The scope of its operations will be nation-wide, and as varied as are the physical and mental ills of mankind. It is believed that as a result of more systematic and comprehensive efforts, the general level of public health in America will be raised," pointed out the *New York Herald Tribune* ("Health Institute Mobilizes Scientists for War on Disease Under Government's Direction," John Snure, July 12, 1931, p. 1). In approving the 1930 Ransdell Act, Congress granted the name change and funds for another building, but because of the economic depression that began in October 1929, maintained the NIH's modest budget of $43,000 in 1931.

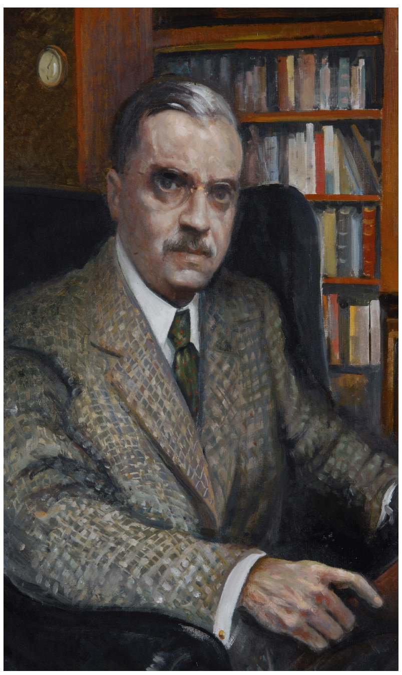
The building up of research responsibilities had a physical manifestation: space problems. Despite construction of laboratory and administration buildings during 1933 and 1934, the NIH's laboratories and offices at 25th and E Streets, NW, filled beyond capacity. Acute space limitations curtailed laboratory activities and crowded animal holding areas threatened the health of both animals and staff. Many animals were required in the testing of biologic products (serums and vaccines) and were also used for research experiments. In addition, the crowding

25th and E Streets, NW
Office of NIH History

prevented the raising of "pure" strains of animals (animals with known genetic backgrounds) bred for specific characteristics. To ensure the welfare of these animals, Surgeon General Hugh S. Cumming of the PHS began looking for a site for an animal farm outside the District of Columbia.

The Wilsons' Search for a Legacy

North of Washington, D.C., a line of estates and country clubs stretched from Bethesda up Rockville Pike. Luke I. Wilson and his wife Helen owned one of these estates, called "Tree Tops," on a high knoll on the southwest corner of Cedar Lane. Born in 1872, Luke Wilson was the son of a successful men's clothing importer and manufacturer. Wilson helped manage the family firm, Wilson Brothers, leaving college after his father's death. He supervised European imports, and between 1890 and 1924, visited Europe 88 times–an impressive record considering the only transportation was by ship. In 1910, he married Helen Woodward, a daughter of one of the founders of Washington, D.C.'s Woodward and Lothrop department stores. They had one son, Luke Woodward Wilson. When Wilson retired in 1924, the family bought Tree Tops.



Luke I. Wilson
Office of NIH History

Helen Woodward Wilson
Office of NIH History

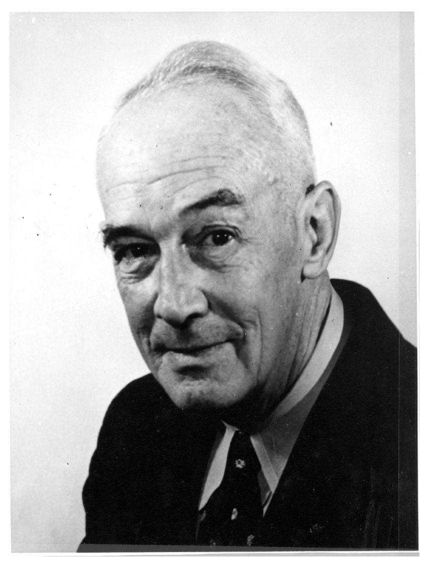
Perhaps because of their extensive European experience, memories of World War I, and the influence of Luke's cousin Hugh R. Wilson (a U.S. representative at the Geneva Disarmament Conference), the Wilsons were keenly interested in fostering good international relations. Their greatest asset was their land. They tried to donate some to establish a sort of diplomatic school where, Wilson wrote, "...boys might be prepared for college, but with the stress of their education being put on public service and cooperation, instead of on the incorrectly termed 'rugged individualism' then prevalent" (letter from Luke Wilson to President Franklin Roosevelt, April 17, 1934). This plan was derailed by the Depression.

The Wilsons then offered property to the Department of the Interior as the site for an international center composed of several foundations and think tanks, but once again the Depression prevented fulfillment of the idea. Giving up on plans that required much funding, the Wilsons next tried to donate land to the Maryland-National Capital Park and Planning Commission for a park. The Commission refused the offer because the Wilsons wanted to continue to live in their house.

At a meeting of the Education Committee of the Women's Democratic Club, Helen Wilson heard of another opportunity to leave a legacy: the need of a site for a school to train teachers of adult education. The Wilsons became excited about the prospect and investigated the possibility of a donation for that purpose, sending another proposal to the Department of Interior. They had no reply.

The NIH Meets the Wilsons

One can imagine the Wilsons' frustration. Finally, in April 1934, Luke Wilson wrote directly to President Franklin Roosevelt offering to donate land to the federal government. At this point, personal ambitions joined political goals. Roosevelt circulated the letter among his administration. "It is interesting to note that when this letter arrived in the Procurement Division of the Treasury Department, it was immediately referred to the Surgeon General of the Public Health Service [Hugh Cumming] because of the general knowledge in the Department that an animal farm was desired for the National Institute of Health. It is also of interest to note that officials in the Division of Finance and the War Department with whom I had been associated also brought the matter to my attention," Dr. Lewis R. Thompson recalled (Cornerstone speech, June 30, 1938). Thompson was then chief of the PHS's Division of Scientific Research, which was not part of the NIH.



Lewis R. Thompson
Office of NIH History

The Wilsons were approached by a few government agencies, but only Thompson visited the site. After seeing it, Thompson began actively courting the Wilsons. Thompson would later say that the Social Security Act of 1935 led him to conceive of the idea of rebuilding the entire NIH (not just an animal farm) in Bethesda. But in November 1934, based on Thompson's reports, Acting Surgeon General John McMullen requested that funds already requested for new NIH laboratory buildings and PHS officers' quarters at 25th and E Streets, NW be transferred to the Wilson site.

Of all the motives for the NIH's move to Bethesda, Thompson's were the most complicated. As a scientist, Thompson was aware that the development of bacteriology, virology, and new drugs would continue to expand the NIH's need for room. As a Capitol Hill insider (his job necessitated much work with Congress), Thompson was also aware of the government's concern about the events in Europe foreshadowing another war; he knew that World War I had revealed massive public health problems in the United States, with thousands of men disqualified for service for medical reasons. Thompson knew the government had an intrinsic interest in the health of its people. As a political believer, Thompson supported Roosevelt's policies that sought to truly democratize the availability of the best medical care to all Americans. And as a man, Thompson perhaps harbored some personal ambitions of his own (he ended up replacing NIH director George McCoy).

Thompson addressed any concerns of the Wilsons. For example, the Wilsons wanted assurance that if they deeded the land to the government without an act of Congress, the PHS could not sell it instead of using it. Thompson included wording in the deed that the grounds were to be used as a site for the construction of buildings for the National Institute of Health of the Public Health Service. This wording put a moral obligation on the government and dispelled the Wilsons' fears. Another major concern of the Wilsons related to their desire to make a difference: they wanted to be sure that the mission of the NIH was compatible with their vision of benefitting mankind. Thompson effectively reassured the couple about the stability of the NIH as a government agency with a broad humanitarian mission. The Wilsons' son said of his parents, "They came to believe that only in science can you truly cross borders" (*NIH Record*, April 29, 2001, front page). In 1935, the Wilsons agreed to donate land for the NIH.

Objections Raised

Luke Wilson was, Thompson described, "... a very fine gentleman, at heart a philanthropist, but also a keen business man, and he did not accept the proposal of the Service until he thoroughly understood the future implications of his act, and what effect the establishment of an animal farm would have, both on his own residential property and that of his neighbors" (Cornerstone laying speech, June 30, 1938). Some neighbors, as well as the Bethesda Chamber of Commerce, the Montgomery County Commissioners, and the Maryland-National Capital Park and Planning Commission, did object to the plans.

Running interference for the Wilsons, Thompson and other PHS representatives met with influential but unconvinced neighbors, inviting some to the NIH to see research in progress. Many decades later, NIH scientist Dr. Herbert Tabor related a popular (but probably untrue) story about the Wilsons' answer to their neighbors' protests:

> "Merchants and other local landowners thought it was a bad idea. It would change the atmosphere of the neighborhood, they argued. It could be unhealthy for residents, if the government was allowed to study infectious diseases and conduct research on animals so

close to homes, other felt. The issue came to a head at a protest meeting held at the Bank of Bethesda.

"Addressing a roomful of her friends and neighbors (most of whom lived on large estates in the area), Mrs. Wilson reputedly said: 'There are only three reasons anyone would want to own an estate: You can raise chickens, raise children or raise hell. I think we're a little too close to the highway for any of these, and thus I decided to give the land to the government for NIH.'"

("Slice of 1930s Saved: Last of 'Treetops,'(sic) Bldg. 15K is Refurbished," by Carla Garnett, *NIH Record*, April 29, 2001, page 1.)

But neighbors were not the only ones who objected to the move. According to Dr. Mark D. Hollis, then a PHS sanitation engineer, the NIH director himself, George W. McCoy, did not favor the move. McCoy told Dr. Rolla Dyer, a senior scientist at NIH, "We've got two new buildings and NIH needs no more space than this" (*A Profile of the United States Public Health Service, 1798-1950*, by Bess Furman, page 397). Dr. Sanford Rosenthal explained McCoy's reservations: "He knew everybody personally; he watched what they were doing. He didn't want it to get out of hand" (Interview with Dr. Victoria A. Harden, Office of NIH Research, April 13, 1981).

McCoy did not share Lewis Thompson's vision. To Thompson the donation provided an opportunity for establishing the NIH on a much larger scale, physically and scientifically. When the Wilsons deeded over the first 45 acres in August 1935, it coincided with the passage of the Social Security Act, which dramatically increased funds for disease and sanitary investigations. A physical move to Bethesda and the Social Security Act would accomplish what Senator Ransdell had begun five years earlier: the establishment of a well-funded, cutting-edge scientific institution to protect America's health.

President Franklin D. Roosevelt signing the 1935 Social Security Act
Office of NIH History

Enter the New Dealer

After Hugh Cumming retired in 1936, Dr. Thomas Parran was appointed Surgeon General. Parran was well-connected in the Roosevelt administration, having served as state health commissioner when Roosevelt was governor of New York (Parran was a PHS officer). Parran, who was also friendly with Thompson, played an important part in writing the Social Security Act of 1935 and getting it passed in Congress. An ardent supporter of Roosevelt's New Deal plan of economic and social reform, Parran believed that it was the government's responsibility to see that all Americans, rich or poor, received the best medical care based on sound medical research. The NIH was an integral part of executing that responsibility.


Surgeon General Thomas Parran
National Library of Medicine

When it seemed that funds for the construction in Bethesda would be held up by Congress, Thompson hinted to Luke Wilson that as the new Surgeon General, Parran would be able to get the project going. Parran's friendship with the President and his experience with Congress were put to good use. Later that year, Congress released $1,363,000 to begin construction in Bethesda. In 1937, Parran consolidated the PHS's Division of Scientific Research with the NIH, removing George McCoy from his position. Lewis Thompson took over as director of the NIH.

A New Institute, A New Support for Research

While solidifying the physical and administrative organization of the NIH, Parran worked closely with Congress on the act establishing the National Cancer Institute (NCI) in 1937. In a unique moment of national consensus, each of the 96 senators then in Congress co-sponsored the NCI legislation, the first time such co-sponsorship had ever occurred. The unanimity reflected widespread public concern about the prevalence of cancer, and presaged a pattern of research funding based on categories of disease. In another innovation, the NCI was authorized to award grants to non-federal scientists and to fund fellowships for young researchers. This innovation became a model for the NIH. While the original legislation failed to specify the NCI's administrative relationship with the NIH, the NCI was designated a component of the NIH in 1944.

In August 1937, three days before Congress passed the bill establishing the National Cancer Institute, Luke Wilson died of bladder cancer. He and his wife had followed the progress of the bill with Thompson. The Sunday after Wilson's death, his widow Helen offered an additional 10.5 acres for the NCI and another 14.4 acres for PHS officers' quarters. This brought the Wilson family's total donation to 70 acres.

Office of NIH History

Entrance to the Wilson estate, c. 1930. This photo was taken by Mrs. Aronie Giles who with her husband, George, was a long-time employee of the Wilson family.

Office of NIH History

The *Time* magazine in the Wilsons' library dates the group of photos to follow to no earlier than April 16, 1934. Architect Edward Clarence Dean redesigned the former 19th century Britton family farmhouse for the Wilsons in the 1920s, mixing elements of both English and American country house traditions.

Office of NIH History

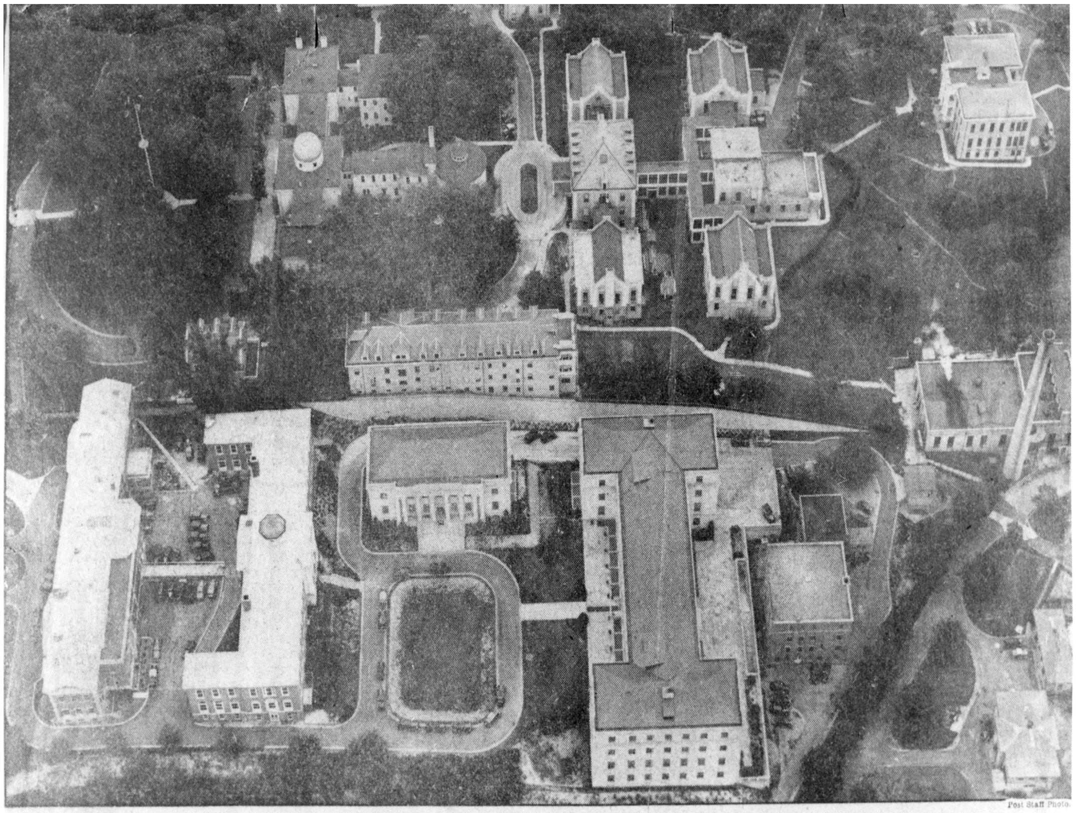
A graceful curved staircase was the centerpiece of Tree Tops' paneled entrance hall. c. 1935.

Office of NIH History

Mrs. Wilson sitting on a rock wall by the lane leading to the estate. c. 1935.

Office of NIH History

View of the lawns from the patio. c. 1935.



Post Staff Photo

NATIONAL INSTITUTE OF HEALTH buildings, research branch of the Public Health Service, as viewed from Goodyear dirigible Enterprise. Buildings in upper half of photo are hospital buildings and officers' quarters of the Naval Hospital. Plans are under way to move the National Institute of Health to Bethesda, in which case the buildings would probably be taken over by Naval Hospital

'.S. N.I.H.

Washington Post, Aug. 19, 1936

Office of NIH History

The *Washington Post* ran this photo on August 19, 1936, with the caption: "National Institute of Health buildings, research branch of the Public Health Service, as viewed from Goodyear dirigible *Enterprise*. Buildings in upper half of photo are hospital buildings and officers' quarters of the Naval Hospital. Plans are under way to move the National Institute of Health to Bethesda, in which case the buildings would probably by taken over by the Naval Hospital." In actuality, the Naval Hospital also moved to Bethesda at about the same time as the NIH–right across Rockville Pike from the NIH.

The two buildings facing each other on the left are the original NIH buildings. The large building in the center of the photo was added in the mid-1930s, along with the smaller building between the old and new buildings.

Office of NIH History

This photograph ran in the September 19, 1967, edition of the *NIH Record*. The caption read: "The above group of NIH administrators and shops personnel was photographed just prior to the move from 25th and E Sts. N.W., to Bethesda in 1938. Seven of these 58 employees are still at NIH. They are: third row, from left, George Epperson and Norvel Van Hounten, both DRS; third row, fifth from left, Fred Atwell, NIAMD; fourth row, from right, Willard Piggott, NIAID, James B. Davis, OD; fourth row, fourth from left, Aloysius Faber; fifth row, second from left, Roskey Jennings. Photo courtesy of Helen Matthews, ORI."

DRS - Division of Research Services
NIAMD - National Institute of Arthritis and Muscular Diseases
NIAID - National Institute of Allergies and Infectious Disease
OD - Office of the Director
ORI - Office of Research Information

Office of NIH History

Hugh S. Cumming (1869-1948, Surgeon General 1920-1936)

Born in Hampton, Virginia, Cumming attended Baltimore City College and the University of Virginia before receiving his doctorate of medicine from the Medical College of Virginia in 1894. He then joined the Public Health Service (PHS--then the Marine Hospital Service).

For his first 20 years as a PHS officer, Cumming was assigned to immigration and quarantine stations in the South, on the Pacific Coast, and in Japan. This experience affected his later work as Surgeon General. In 1925, Cumming inaugurated the medical inspection of immigrants in their countries of origin at the time that they applied for a United States visa. This practice reduced the number of immigrants who were turned away for medical reasons after making the trip to America, saving numerous people their time and their life savings.

From 1913 to 1916, Cumming headed a tidal water pollution study of the effects of contamination on shellfish. The survey started in the Potomac River but quickly grew to include other locations. Cumming used this experience during a 1924-1925 outbreak of typhoid fever in New York City, Chicago, and other cities to discover that the cause was contaminated raw oysters from New York. After this, the shellfish industry requested that the PHS establish a system of sanitary control for the industry.

During World War I, Cumming was assigned to the Navy, supervising PHS activities in Europe related to the many sanitation problems spurred by the number of returning troops. His job was to protect the United States from the introduction of diseases by soldiers returning home from Europe.

Cumming served as Surgeon General from March 3, 1920, to January 31, 1936. His contributions include expanding field investigations; modernizing old and building ten new Marine Hospitals; supervising veterans' care until the establishment of the Veteran's Administration; supervising the expansion of research at the National Institute of Health after the 1930 Public Health Act; and securing the authorization for dentists, pharmacists, and sanitary engineers to be included in the PHS Commissioned Corps.

After retiring as Surgeon General, Cumming served as director of the Pan American Sanitary Bureau until 1947.

Thomas Parran (1892-1968, Surgeon General 1936-1948)

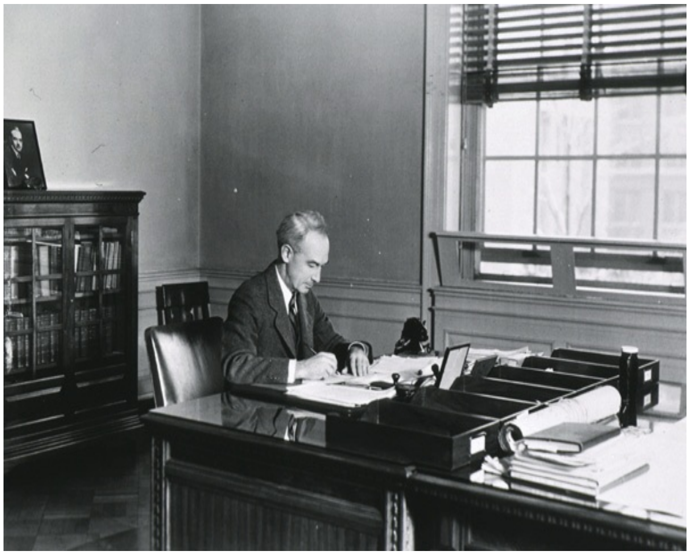
Office of NIH History

Parran was born in St. Leonard, Maryland. He graduated from St. Johns College in Annapolis in 1911, and in 1915, received his doctorate of medicine from Georgetown University Medical School. As a medical student, he volunteered at a laboratory run by Dr. Joseph J. Kinyoun, founder of the Hygienic Laboratory (later the National Institute of Health). Kinyoun recruited Parran into the Public Health Service (PHS) in 1917. Parran spent the rest of World War I supervising sanitation activities at Muscle Shoals Dam in Alabama. After the war, he was loaned to the Veteran's Bureau and then to the state health department for Missouri, Arkansas, and Oklahoma.

In 1926, Parran returned to Washington, D.C., as the chief of the Division of Venereal Diseases, a subject which became his specialty. Parran extended the Division's outreach to state and local health departments. His lifelong goal was to break down the social stigma surrounding syphilis to redefine it as a medical, not moral, disease. As Surgeon General, Parran wrote a 1937 book about syphilis, *Shadow on the Land*, that openly discussed this serious disease long ignored because of the shame associated with it. He also dared to say the word "syphilis" in public on the radio, bringing even more attention to the problem.

In 1930, Franklin Roosevelt, governor of New York, requested that a PHS officer be assigned to the New York State Health Office as its director to reorganize public health work in that state. Parran was loaned out to this position and made the personal acquaintance of Roosevelt. While in New York, Parran adopted Roosevelt's New Deal politics and became an advocate of national health programs. In 1934, Roosevelt, as president of the United States, appointed Parran to the Committee on Economic Security, which drafted the Social Security Act of 1935. In 1936, Roosevelt called upon Parran to become Surgeon General.

As Surgeon General, Parran was politically active, helping to get the 1937 National Cancer Act (establishing the National Cancer Institute) and the 1946 National Mental Health Act (establishing the National Institute of Mental Health) passed. In response to new responsibilities for the PHS during World War II, Parran and his deputies rewrote the statutes underlying the PHS's operations–the Public Health Service Acts of 1943 and 1944–establishing a four-bureau structure that would remain in place through 1967. Parran also increased support of non-federal research, developed a national tuberculosis control program, and organized the Communicable Disease Center in Atlanta. He initiated plans for a hospital dedicated to clinical research at the NIH, opened in 1953 as the Clinical Center, and helped to secure health programs for federal employees.


National Library of Medicine

Lewis R. Thompson (1883-1954, NIH director 1937-1942)

Thompson, who was born in Lafayette, Indiana, joined the Public Health Service (PHS) in 1910, after graduating from Louisville Medical College, Kentucky. In 1915, he devised a new fumigant to be used on ships to kill rodents and insects which carry disease. Formerly, cyanide gas had been used with caged birds acting as warning signs to ship personnel: if the workers saw the birds dying, the workers were to get out. This method left much to be desired. Thompson found that cyanogen chloride gas was as deadly to insects and rodents as cyanide gas but had an element in it that stimulated tears in time to warn workers. This fumigant was used for several years aboard ships.

A 1916 outbreak of polio in New York City gave Thompson a lesson in conducting epidemiology studies. By 1920, he became the director of the Office of Industrial Hygiene and Sanitation, where he focused on stream pollution and hazards to workers in the "dusty" trades such as mining. Thompson wrote a series of monographs on the health of such workers.

After becoming chief of the Division of Scientific Research of the PHS in 1930, Thompson administered field investigations of stream pollution, malaria, cancer, nutritional diseases, child hygiene, milk, dental problems, and industrial hygiene. In 1937, Thompson became director of the NIH when the NIH and the Division of Scientific Research merged. He had already sought out and personally secured a donation of land for the NIH in Bethesda, Maryland from Luke and Helen Wilson. Thompson also worked with Surgeon General Thomas Parran to secure appropriations for construction of the first six buildings on the new campus.

As the NIH director, Thompson oversaw the expansion of the research programs and the responsibilities of the NIH, especially during the beginning of World War II. After retiring in 1942, and upon Parran's request, Thompson became the first chief of the Bureau of State Service at the PHS.

Office of NIH History

Helen Woodward Wilson (1877-1960)

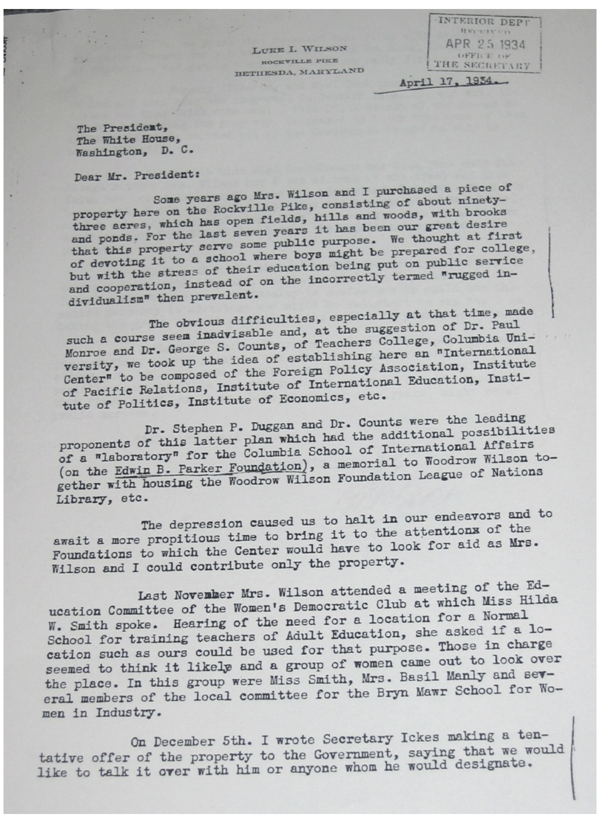
Helen Wilson was the eldest daughter of the S. W. Woodward family, cofounders of the Washington, D.C.-based Woodward & Lothrop department stores. As a girl and young woman, Wilson lead a fairly typical life for a wealthy woman of her time, including visiting Europe. She attended Smith College, where she said her interest in medical research began, graduating in 1897. She married Luke Wilson, who co-owned the Wilson Brothers clothing company, in 1910, and they had one son, Luke Woodward Wilson. The Wilsons retired in 1924, moving to the Bethesda, Maryland estate known as "Tree Tops." From 1935 to 1942, Wilson donated 92 acres of the estate to the National Institute of Health (Luke Wilson, 1872-1937, was active in the initial donations). Wilson continued to live in one of Tree Tops' minor houses on the campus called "The Lodge." She also continued her and her husband's involvement in politics and philanthropy, supporting a variety of causes, candidates, and charities with parties and rallies held at the estate.

A Closer Look: The Wilson Correspondence

The correspondence generated by Luke and Helen Wilson's donation to the federal government tells of the Wilsons' frustrations and hints of the backroom politics that landed the donation for the National Institute of Health.

Wilson had offered his Bethesda property as the site for an international education center, but the proposal floundered for a number of reasons. So in January 1933, Wilson contacted the Assistant Secretary to the President, Marvin McIntyre, asking him to look at the property and give the Wilsons some ideas. A week later, Wilson felt compelled to assure McIntyre that his reason for wanting to donate land to the government was not to seek political favors.

In March of 1934, Marvin McIntyre cleaned out his old files, finding Luke Wilson's letters of the previous year. He forwarded them to the National Capital Park and Planning Commission (NCCPC) for their suggestions as to what to do with the offer. But as the NCCPC's Director of Planning, John Nolen, explained in a letter to the NCCPC's Chair, Frederic Delano, the NCCPC had already voted not to accept the Wilsons' offer in December of 1933. The NCCPC felt that the Wilsons should donate the land to a non-profit, not the government.



LUKE I. WILSON
ROCKVILLE PIKE
BETHESDA, MARYLAND

INTERIOR DEPT
RECEIVED
APR 25 1934
OFFICE OF
THE SECRETARY

April 17, 1934.

The President,
The White House,
Washington, D. C.

Dear Mr. President:

Some years ago Mrs. Wilson and I purchased a piece of property here on the Rockville Pike, consisting of about ninety-three acres, which has open fields, hills and woods, with brooks and ponds. For the last seven years it has been our great desire that this property serve some public purpose. We thought at first of devoting it to a school where boys might be prepared for college, but with the stress of their education being put on public service and cooperation, instead of on the incorrectly termed "rugged individualism" then prevalent.

The obvious difficulties, especially at that time, made such a course seem inadvisable and, at the suggestion of Dr. Paul Monroe and Dr. George S. Counts, of Teachers College, Columbia University, we took up the idea of establishing here an "International Center" to be composed of the Foreign Policy Association, Institute of Pacific Relations, Institute of International Education, Institute of Politics, Institute of Economics, etc.

Dr. Stephen P. Duggan and Dr. Counts were the leading proponents of this latter plan which had the additional possibilities of a "laboratory" for the Columbia School of International Affairs (on the Edwin B. Parker Foundation), a memorial to Woodrow Wilson together with housing the Woodrow Wilson Foundation League of Nations Library, etc.

The depression caused us to halt in our endeavors and to await a more propitious time to bring it to the attentionx of the Foundations to which the Center would have to look for aid as Mrs. Wilson and I could contribute only the property.

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On December 5th. I wrote Secretary Ickes making a tentative offer of the property to the Government, saying that we would like to talk it over with him or anyone whom he would designate.

Office of NIH History

After trying to donate land to a worthwhile cause only to have their offers shot down by the economics of the Depression, lost in files, or turned down by short-sighted bureaucrats, one would think that the Wilsons might give up. But they were persistent. When Helen Wilson learned that there was a need for a school to train adult education teachers, the Wilsons offered their land for that. Although interest was keen on the part of the teachers, the donation seemed stuck in the Department of the Interior. Finally, Luke Wilson took matters into his own hands by writing directly to President Franklin D. Roosevelt.

April 17, 1934, Luke Wilson to President Franklin D. Roosevelt transcript:

"Some years ago Mrs. Wilson and I purchased a piece of property here on the Rockville Pike, consisting of about ninety-three acres, which has open fields, hills and woods, with brooks and ponds. For the last seven years it has been our great desire that this property serve some public purpose. We thought at first of devoting it to a school where boys might be prepared for college, but with the stress of their education being put on public service and cooperation, instead of the incorrectly termed 'rugged individualism' then prevalent.

"The obvious difficulties, especially at that time, made such a course seem inadvisable and, at the suggestion of Dr. Paul Monroe and Dr. George S. Counts, of Teachers College, Columbia University, we took up the idea of establishing here an 'International Center' to be composed of the Foreign Policy Association, Institute of Pacific Relations, Institute of International Education, Institute of Politics, Institute of Economics, etc.

"Dr. Stephen P. Duggan and Dr. Counts were the leading proponents of this latter plan which had the additional possibilities of a 'laboratory' for the Columbia School of International Affairs (on the Edwin B. Parker Foundation), a memorial to Woodrow Wilson together with housing the Woodrow Wilson Foundation League of Nations Library, etc.

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"On December 5th. I wrote Secretary [of the Interior Harold] Ickes making a tentative offer of the property to the Government, saying that we would like to talk it over with him or anyone whom he would designate. On December 7th. he wrote that he would take it up with Assistant Secretary [of the Interior Oscar L.] Chapman and ask him to confer with Dr. [George F.] Zook, Commissioner of Education, and get in touch with me at an early date.

"On January 13th. Dr. and Mrs. Zook came out for a cup of tea and went over the property. On January 14th Dr. and Mrs. Alderman and Miss Smith came out. I told Dr. Alderman of the dreams we had had concerning the property. He seemed to think that some of them at least might be carried out if the Government should be able to accept the gift.

"Since that time Miss Goodykoontz has been here once (although neither Mrs. Wilson nor I was at home at the time) and Miss Smith has been here several times. I understand that the matter has been in the hands of the Solicitor for the department of the Interior for some time and that those with whom we have been in touch are awaiting word from him as to whether the Department could use the property.

"Further than the above I have heard nothing, nor have I seen anyone in authority and, realizing that the department of the Interior might have some difficulty in seeing how it could use the entire property to advantage and might be reluctant to say so, I am taking the great liberty of calling the matter to your attention.

"Either Mr. Huston Thompson or Secretary [of Commerce Daniel C.] Roper can tell something of our plans in the past regarding the property. I cannot but feel that some combinations with other departments (especially those of State and Agriculture) might be brought about so that 'Tree Tops', as it has been known for many years, might be of public service."

On May 3, President Roosevelt responded to the Wilsons that the reason they had not heard from the Secretary of the Interior was because the Attorney General had been asked for his legal opinion on the matter. The Attorney General believed that the donation could not be accepted without express authority from Congress. Roosevelt offered to bring the matter before Congress, but suggested that the Wilsons not put limitations on the use of the property so that Congress would be more favorably disposed toward accepting the donation. Roosevelt also forwarded the Wilsons' offer to his other cabinet members.

After Roosevelt had done this in the spring of 1934, a few government departments expressed interest in the site. Only the Public Health Service (PHS) followed through with visits to the Wilsons and specific suggestions for use of the land. On November 12, more than a little presumptively considering that the Wilsons had not yet agreed to the donation, Acting Surgeon General John McMullen wrote to the Director of Procurement of the Treasury Department (under which the PHS was organized). He told the Procurement Director that on December 7, 1933, the Surgeon General submitted a memo with new construction projects for the PHS including the National Institute of Health. A laboratory building and officers' quarters were originally to be constructed at 25th and E Streets, NW, but since the Wilsons had donated land for an experimental station, the Surgeon General would like to move the project to Maryland from Washington, D.C.

After the frustrating years of trying to donate their land, the PHS' moves to secure the site for the National Institute of Health might have seemed amazing to the Wilsons. At the end of November 1934, they wrote to Assistant Surgeon General Lewis Thompson requesting to know just what he had in mind for their land. John McMullen, acting Surgeon General, outlined Thompson's vision.

December 5, 1934: John McMullen, Acting Surgeon General to Luke Wilson, transcript:

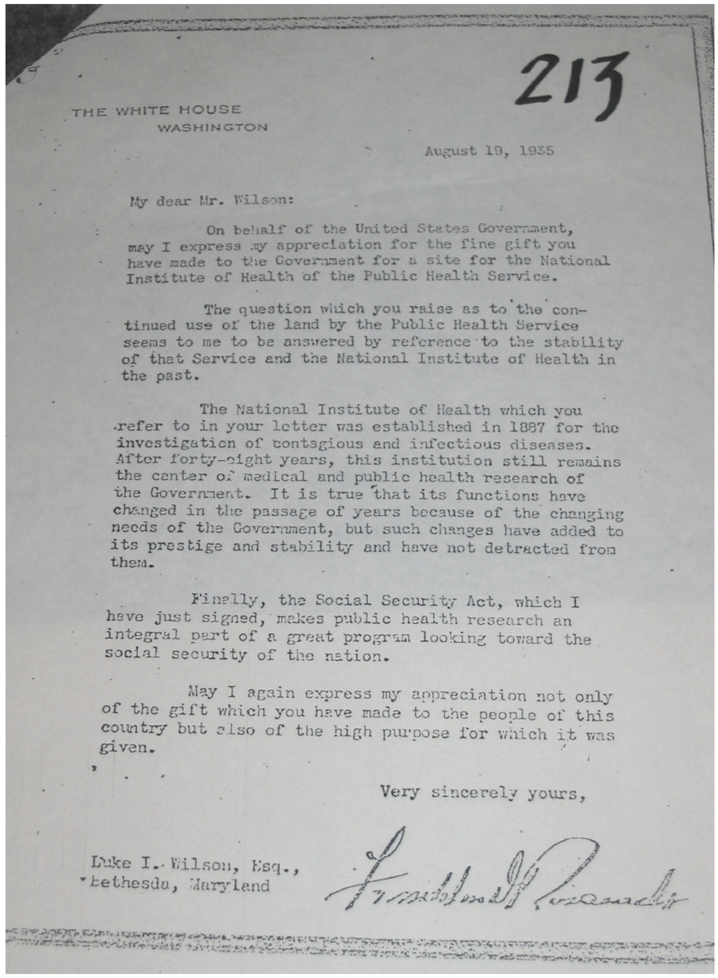
"I am in receipt of your letter of November 27, addressed to Dr. Thompson, in which you ask for a general outline of the proposed use of your property by the Public Health Service.

> "The responsibility for protecting the people of the United States in their use of potent reliable biological products is required of the Public Health Service under the law. As a part of this work the Service is required to develop standards which may be used both in this country and abroad by biological concerns for the manufacture of their products. The development of these standards requires the highest type of laboratory technique, the use of the most accurately made equipment, and the use of known strains of animals such as white mice and rats, guinea pigs and rabbits.
>
> "The immediate use of the ground would be in the development of an Experimental Station for the raising of pure strains of animals used in the control of biologics. The future plan of the Public Health Service is, however, of much broader importance to the Government. It is our intention that eventually the station would be enlarged to contain the various laboratories of the field investigation studies of the Service concerned with malaria, industrial hygiene, milk sanitation, nutrition and others. In addition, it is proposed to develop a series of quarters for the housing of the staff of the laboratory and the younger officers of the Service brought to Washington for purposes of training.
>
> "There is available for immediate development $100,000 to begin construction of the first building, and in addition approximately $675,000 has been requested of the Treasury Department for laboratories and quarters."

The Wilsons were not easily won over to the PHS vision; they were concerned because the plan would not require an act of Congress to accept the donation so that the PHS might be able to sell the land. Just two days after McMullen wrote his letter to the Wilsons, Luke Wilson wrote again to President Roosevelt, seeking assurances. Roosevelt responded, throwing his support behind the PHS proposal and suggesting that if the Wilsons so desired, the Secretary of the Interior would introduce a bill to Congress to accept the donation.

The Wilsons must have expressed further apprehensions about the PHS plans because in March 1935, Thompson wrote them a long letter assuring them of two things: that the proposed buildings would be "dignified" in design and that the work of the National Institute of Health was a government priority that would not easily be changed. Thompson asked the Wilsons for their consent for the donation of land for an experimental station and possible future buildings as soon as possible so that the money could be legally obligated to the project. Two days later, the Wilsons formally offered to donate a portion of their property, not all of it, for the National Institute of Health experimental station.

Throughout the spring and summer of 1935, the formal donation offer made its way through the levels of approval required, from the Surgeon General to the Treasury Department. The deed transferring the land to the government purposely used the words, "To be used as a site for the construction of buildings for the National Institute of Health of the Public Health Service." This wording put a moral obligation on the government and helped to allay the Wilsons' fears about the future use of the land. In August, Roosevelt formally thanked the Wilsons for their donation.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THE WHITE HOUSE
WASHINGTON

August 19, 1935

My dear Mr. Wilson:

On behalf of the United States Government, may I express my appreciation for the fine gift you have made to the Government for a site for the National Institute of Health of the Public Health Service.

The question which you raise as to the continued use of the land by the Public Health Service seems to me to be answered by reference to the stability of that Service and the National Institute of Health in the past.

The National Institute of Health which you refer to in your letter was established in 1887 for the investigation of contagious and infectious diseases. After forty-eight years, this institution still remains the center of medical and public health research of the Government. It is true that its functions have changed in the passage of years because of the changing needs of the Government, but such changes have added to its prestige and stability and have not detracted from them.

Finally, the Social Security Act, which I have just signed, makes public health research an integral part of a great program looking toward the social security of the nation.

May I again express my appreciation not only of the gift which you have made to the people of this country but also of the high purpose for which it was given.

Very sincerely yours,

Franklin D Roosevelt

Luke I. Wilson, Esq.,
Bethesda, Maryland

August 19, 1935: President Franklin D. Roosevelt to Luke Wilson, transcript:

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"May I again express my appreciation not only of the gift which you have made to the people of this country but also of the high purpose for which it was given."

In September 1935, the Wilsons sailed to Europe for a vacation, leaving Assistant Surgeon General Lewis Thompson to take care of the details of the title transfer and to face the questions of the disapproving Bethesda Chamber of Commerce. Apparently Thompson had become friends with the Wilsons in the preceding months: Thompson's letter to Wilson has the confiding tone of a friend, not a bureaucrat. "So many things have happened and so many things haven't happened that I felt you would like to know how things are progressing," Thompson wrote (September 11, 1935: Assistant Surgeon General Lewis R. Thompson to Luke Wilson).

The day after Christmas, 1935, Thompson wrote again to the Wilsons about the initial construction plans, gift form, and yet another meeting with the Wilsons' immediate neighbors. Then Thompson wrote in an oblique way about future plans, meaning the building of laboratories and officers' quarters on the site. He declared that he had an "ace in the hole." Dr. Hugh Cumming was going to retire as Surgeon General and Dr. Thomas Parran was going to take his place.

December 26, 1935: Assistant Surgeon General Lewis R. Thompson to Luke Wilson, transcript:

"I am sorry not to have answered your letter of December 14 at an earlier date, but as I told you over the telephone, this has been our busy time with the Appropriation Committee of Congress.

"The cabinet sketches have not yet been approved by the Surgeon General, but everything has been progressing in a very satisfactory way. According to the preliminary plans, in order to reserve as much money as possible for the first building, the first road will enter the property near the line which divides the Government's property from Canon [Freeland] Peter's. The survey showed that this could be done at the least cost of grading. It will come down to the creek where it would meet the permanent road that is sketched on your plan. The permanent entrance would be a part of the future plan.

"With regard to the gift form for the National Institute of Health, it still is not finished, being in the hands of the legal department. Tell your son that if lawyers were doctors all the patients would be dead before the cure arrived.

"I told you of the conference with Mr. [Freeland] Peter, Mr. [Gilbert] Grosvenor [editor of *National Geographic* magazine], Mr. Saks, Mr. [George] Hamilton and Mr. [Merle] Thorpe. It was very satisfactory from the standpoint that Mr. Grosvenor became quite impatient with Mr. Hamilton and tried to point out the desirability rather than the undesirability of the project. I am sure he is our strong friend. The Surgeon General asked Mr. Hamilton in a nice way but rather plainly just what he was going to do about it, and only the other day Canon [Freeland] Peter called me to inquire if there was any change in our plans. I told him there was none. He has told me that he is interested in the two proposed new streets which will touch his property, the one between the Government's land and his own and the Rock Creek Park development which would follow the creek. [Canon Peter's estate was called 'Stone House'; it later became a part of the NIH campus.]

"There isn't any late official news of our future plans. This sudden economy streak may have its effect but I have one ace in the hole which may help.

"As I think I told you, Dr. Cumming is to retire in the late winter (this has not been made public yet, although the Secretary and the President know of it). His successor will be Dr. Parran, one of my best friends and a close personal friend of the President. I feel that his influence will carry great weight, and I know he favors the project.

"I certainly will try to keep you informed as to the development of things.

"Very best wishes for the holidays and of course for a continued happy and pleasant life this next year for you and your good family."

Over the next two years, as the plans for the new buildings took shape and Thompson became the director of the NIH, Thompson and the Wilsons kept in touch. They discussed the placement of buildings, the progress of construction, and the passage of the National Cancer Act in 1937. By the time that Luke Wilson died in August 1937, he and his wife Helen and Thompson had become more than correspondents, they were co-developers of the NIH at Bethesda.

CHAPTER 2: CONSTRUCTION OF THE FIRST SIX BUILDINGS

On January 11, 1938, Surgeon General Thomas Parran and Mrs. Helen Wilson ceremoniously began the excavation for the first building on the new National Institute of Health (NIH) campus in Bethesda, Maryland. A mere six months later, on June 30, 1938, workers installed the cornerstone for Building 1. Several Congressmen, Roosevelt administration officials, and the National Advisory Health Council attended. The ceremony planners even invited the President of the Bethesda Chamber of Commerce, although the Chamber had opposed the move of the NIH to Bethesda.


Morgenthau, Wilson, and Parran
National Library of Medicine

Secretary of the Treasury Henry Morgenthau (the Public Health Service (PHS) came under the Treasury Department), gave a brief speech, declaring that he had laid cornerstones for many federal buildings such as post offices and custom houses, but that there was only one NIH. NIH Director Lewis Thompson detailed the history of the Wilsons' donation and the expansion of the NIH and medical research. He concluded by saying, "I do not know of any other officer of my own times and I doubt if there will be many in the future to have the pleasure, excitement and good luck to be personally instrumental in the development of an institution such as the National Institute of Health now is in 1938" (Cornerstone laying speech, June 30, 1938).

The cornerstone was a time capsule. Inside it were articles about NIH scientists' research, a history of the site, copies of the correspondence between Luke Wilson and President Franklin Roosevelt, and copies of the deed and title to the land that the Wilsons donated. Examples of the work produced at the NIH were included, such as regulations for the sale of serums, the milk code, and disease and pollution studies. A list of persons infected with disease in the line of duty was also tucked into the cornerstone.

"The Intricacies of Detail"

The new buildings were state-of-the-art research facilities, unlike the buildings at 25th and E Streets, NW. As Dr. Rolla E. Dyer later recalled, only somewhat tongue in cheek, "The buildings at 25th and E were wonderful places for scientific research. Quiet was only disturbed by occasional visitors, leaking water pipes, building repairs, and escaped monkeys. The buildings had wooden floors and plaster walls, and in some sections of the North Building the water and gas pipes were under the wooden floor. Floor leaks, which were not infrequent on the second floor, resulted in the falling of plaster from the ceiling in the room below. This ceiling difficulty often occurred over the director's desk. This, of course, caused some inconvenience to the director, but did not interfere with the scientific research to any great extent. In the North Building there were three toilets, one on each floor, the one on the first floor being reserved for ladies. The other toilets would accommodate one person at a time. There was one telephone in the basement, four on the first floor and two on the second floor. There was about the same number of phone extensions in the South Building and one in the animal house. Telephone service was handled at a small switchboard by a messenger. When the messenger was absent, anyone passing in the neighborhood of the switchboard took charge of operations, if the phone happened to ring" (Rolla E. Dyer interview in the George Rosen Collection of Oral History Transcripts, History of Medicine Division, National Library of Medicine, MS C 203).

The new buildings in Bethesda tripled the space available to the NIH's laboratory and administrative staffs. Unlike the old buildings, the new buildings had complete ventilation systems with 100 large-capacity exhaust fans for chemical hoods and animal rooms. The campus had its own power plant and sewage pumping system with considerably more steam supply, electrical capacity, and refrigeration available. But modernity of function was matched by a deliberately historical design reference: Georgian-style red brick buildings with two double chimney "pents" on either end harkened back to Colonial Maryland architecture. The George A. Fuller Company was the construction contractor for Buildings 1-3 and Building 6, while the Charles H. Tompkins Company handled the construction of Buildings 4 and 5 and the PHS officers' quarters.

As in most construction projects, not all flowed smoothly. On the morning of April 18, 1938, during the construction of Building 1, a crane fell into the trench being dug for a storm sewer. As the crane toppled, the crane operator jumped to safety and workmen in the trench scrambled for their lives. One man was trapped in the trench under the crane. A stunned plumber dropped a torch, igniting a gas leak from the motor of the crane. The incident had a happy ending: the Bethesda fire company put out the fire before much damage was done and the man stuck in the trench was spared serious injury–he had a cut below his eye.

Excavations, February 1938
Office of NIH History

Contractors were constantly delayed because labor strikes disrupted their supplies. The telephone company put in the wrong wiring and the fire alarm system would not work. W. F. Dougherty & Sons, kitchen equipment contractors, complained, "This job was one of those unfortunate experiences which all businessmen go through from time to time. It just seemed that everything went wrong for us from the start" (Letter from J.S. Dougherty, W.F. Dougherty & Sons, to Mr. Henry R. Leslie, Construction Engineer, NIH, May 2, 1940). One of Dougherty's workmen inadvertently broke a pipe in the kitchen which leaked into the library of Building 1, causing $7,000 in damage to the books. In addition, the dishwasher and cashier stands in the cafeteria had to be reinstalled. Installation of state-of-the-art laboratory equipment such as exhaust fume hoods made one contractor complain, "Our experience has nowhere encountered the intricacies of detail and difficulties connected with our prosecution of the work at the National Institute of Health, Bethesda" (C.T. Campbell, Kewaunee Manufacturing Co., to Mr. G.H. Roberts, Federal Works Agency, November 21, 1939).

Despite the challenges, construction and occupation of the new buildings proceeded quickly. By December 1938, NIH's administrative staff and library had moved into Building 1. The other buildings were finished and occupied by June 1940. Building 1 served as the Administration Building and boiler plant. It contained the Director's and other administrators' offices, the library, cafeteria, and shops for carpenters, electricians, metal workers, plumbers, and painters. It also included an auditorium with a "moving picture screen" for gatherings of the increasingly numerous staff. This auditorium is now called Wilson Hall.

Building 2 contained the first laboratories in the United States built solely for the study of industrial hygiene in the nation. Building 3 was dedicated to the Public Health Methods Division and the Animal Unit. The Divisions of Chemistry, Pharmacology, and Zoology filled Building 4, while Biologics Control and Infectious Diseases took over Building 5. Each laboratory in these buildings had hot and cold running water, and built-in ventilating fume hoods, air hoses, vacuums, and waste outlets. Electricity was wired through conduits contained in service panels built into the walls. The panels provided stable electrical power to any laboratory and cables could be patched in to hook up laboratory equipment.


Buildings 1-3 completed
Office of NIH History

Building 6 was devoted to the National Cancer Institute. In addition to cold rooms, it included a hot room to keep tissue cultures warm. The room had automatic temperature control (unusual in the 1930s) with a recording thermometer to track temperature over time. X-ray laboratories were specially constructed as well, with cinder blocks with lead cores in them for the walls and lead insulated lath on the ceiling.

When President Franklin Roosevelt dedicated the campus in October, 1940, the buildings in Bethesda provided the NIH with some of the finest laboratories in the world. By 2006, the campus held over 50 buildings. Like the first six buildings, each subsequent building is an example of the cutting edge of technology for its time.

Helen Wilson
Office of NIH History

January 11, 1938: Helen Wilson waves from the cab of an excavator used in the ceremony to break ground for Building 1. She is still wearing her widow's black; Luke Wilson had died five months earlier.

By November, 1938, Building 1 was already in use as the Administration Building, housing the director, auditorium, library, and cafeteria.

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c. 1938: a workman painted the Building 1 flagpole.

Building 2, Industrial Hygiene

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April 1938: outbuildings of the Wilson estate visible from the excavation for the foundation of Building 2.

Office of NIH History

December 15, 1938: Building 2 completed and ready for NIH staff to move in.

National Library of Medicine

A laboratory in Building 2, c. 1938. Building 2 was a state-of-the-art laboratory building when it opened. Note the two fume hoods in the back. Electrical panels in the wall allowed each laboratory to configure equipment as needed and prevented power surges.

Building 3, Public Health Methods

Office of NIH History

July 1, 1938: Building 1 was further behind in the construction process than Building 3, which had its brickwork finished.

August 1938: a workman installed window frames into Building 3.

Office of NIH History

Building 4, Divisions of Chemistry, Pharmacology, and Zoology

Office of NIH History

March 1940: the foyer of Building 4 with three sets of double doors; two lead to the wings and one to the main entrance.

Office of NIH History

March 1940: an animal holding room in Building 4 with mesh cages, most likely for dogs. Note the ventilation fans: the animal rooms at the old buildings at 25th and E Streets, NW, did not have any.

Office of NIH History

June 12, 1940: Building 4 after opening.

Building 5, Divisions of Biologics Control and Infectious Diseases

Office of NIH History

December 1939: workmen installed a drain pipe on the side of Building 5.

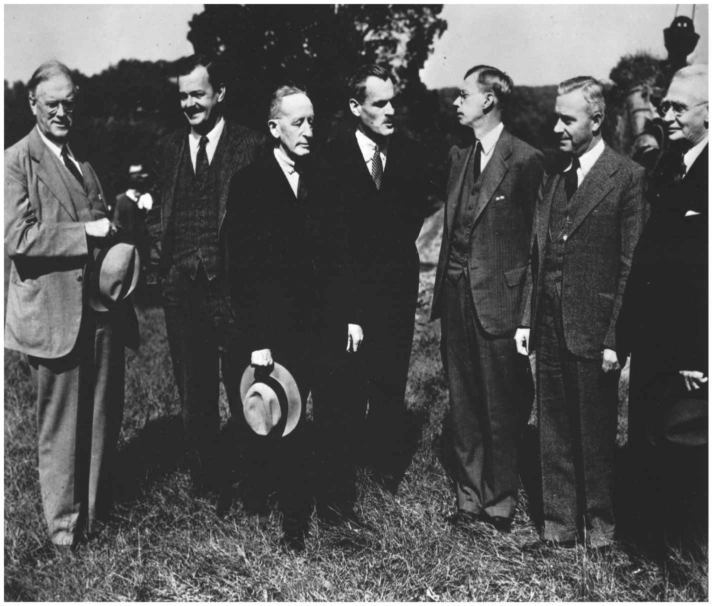
Office of NIH History

May 14, 1940: a bathroom in Building 5.

Office of NIH History

May 14, 1940: completed cold storage room and laboratory.

Building 6, National Cancer Institute



National Cancer Institute

June 1938: Members of the first National Advisory Cancer Council at the groundbreaking ceremonies for Building 6. The Council was established in the 1937 National Cancer Institute Act to advise the government and the NCI on matters pertaining to cancer research and training for investigators. (Left to right) Dr. Francis C. Wood, Director of the Crocker Institute of Cancer Research at Columbia University; C. C. Little, Managing Director of the American Society for the Control of Cancer; James Ewing, Director of Memorial Hospital; Dr. Arthur H. Compton, University of Chicago; Harvard University President James B. Conant, Surgeon General Thomas Parran, and Dr. Ludwig Hektoen of Chicago.

January 1939: Building 6's foundation.

Office of NIH History

Office of NIH History

September, 1939: Building 6 was nearly ready.

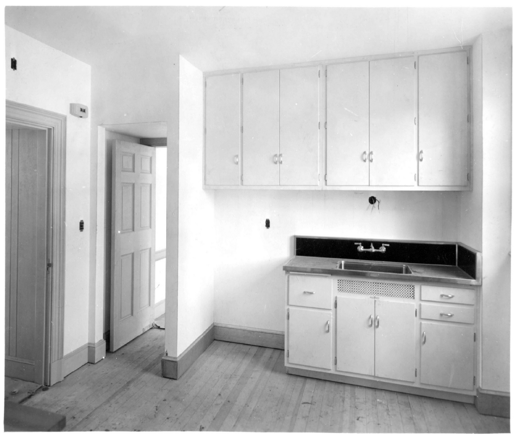
National Cancer Institute

September, 1939: Dr. Leonard A. Scheele at the end of a hallway in Building 6. In 1939, Scheele became the officer in charge of the National Cancer Control Program at the National Cancer Institute. He succeeded Thomas Parran as Surgeon General in 1948, serving until 1956.

Public Health Service Officers' Quarters

Duplex

The Public Health Service (PHS) officers' quarters consisted of six duplexes (15B-G) and two single family homes (15H-I). Buildings 15A and 15K were in use by the Wilson family but later became part of the NIH campus. Building 15K was the estate house, Tree Tops, and is now used by the National Institute of Mental Health.



Office of NIH History

November 1939: the kitchen in duplex 15-F. A refrigerator would be installed.

Office of NIH History

January 3, 1940: the stairway in duplex 15-B.

Office of NIH History

January 3, 1940: duplex 15-B's living room.

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April 14, 1940: duplex quarters 15-D.

Single Family Homes

Office of NIH History

September 1939: workmen on the porch of single family quarters 15-I.

Office of NIH History

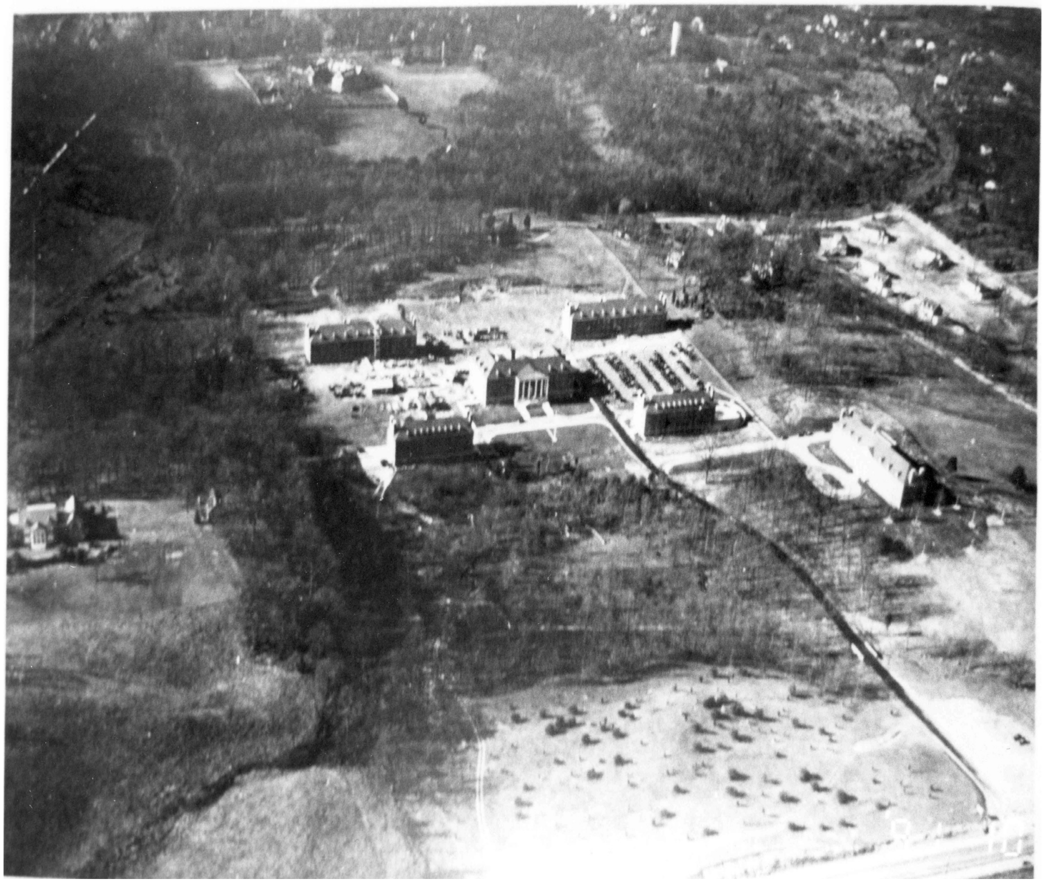
December 1939: the living room of single family quarters 15-I. Note the built-in bookcases with glass doors, French doors onto the porch, and the wainscoting above the fireplace.

Office of NIH History

December 1939: the dining room of 15-I.

Office of NIH History

April 14, 1940: single family quarters 15-I.

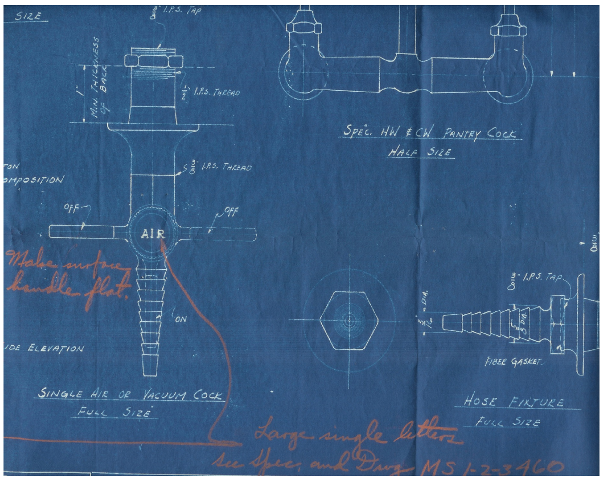


Office of NIH History

This 1940 aerial view shows Buildings 1-5 in the middle with Building 6 by itself on the right. The quarters for Public Health Service officers are in the top right of the photo. On the far left is Stone House, Canon Freeland Peter's estate house. Peter's land and house later became part of the NIH campus.

A Closer Look: Construction Documents

The Office of NIH History is the caretaker of the records, both photographic and written, for the construction of Buildings 1-6. These records reveal not only how large projects were handled in the 1930s, but also how involved the scientists were in designing their state-of-the-art buildings. This involvement even extended to the type of Venetian blinds needed (wood with metal tapes that wouldn't corrode) and the lettering on laboratory fixtures.



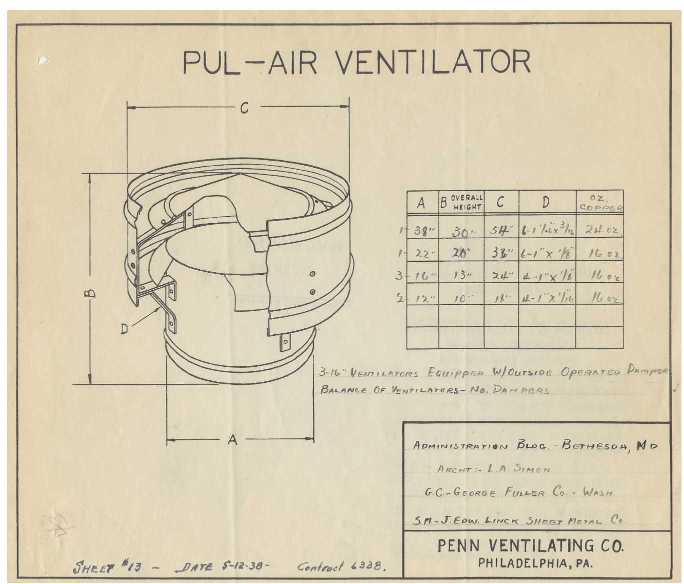
Office of NIH History

Kewaunee Manufacturing Co. laboratory fixtures

The laboratories in the new buildings were designed so that technicians and scientists could readily access the tools they needed. The Kewaunee Manufacturing Company's Metal Division developed and installed easy-to-use, built-in nozzles for gases, air, and water.

Penn Ventilating Co. Pul-Air Ventilator

Ventilation was an important consideration in buildings that housed animals and scientists working with chemicals and biological agents. One of the improvements that the Bethesda buildings offered was vastly better ventilation, even in office areas (also important in an era of no air conditioning). This drawing is for a Pul-Air Ventilator for Building 1, made by the Penn Ventilating Co. as a subcontractor to J. Edward Linck Co.



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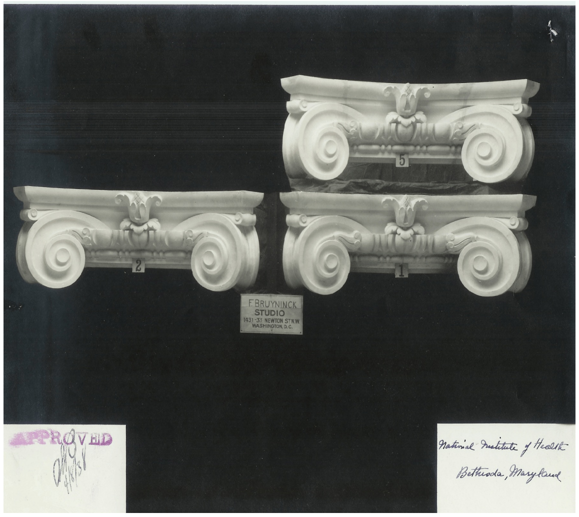


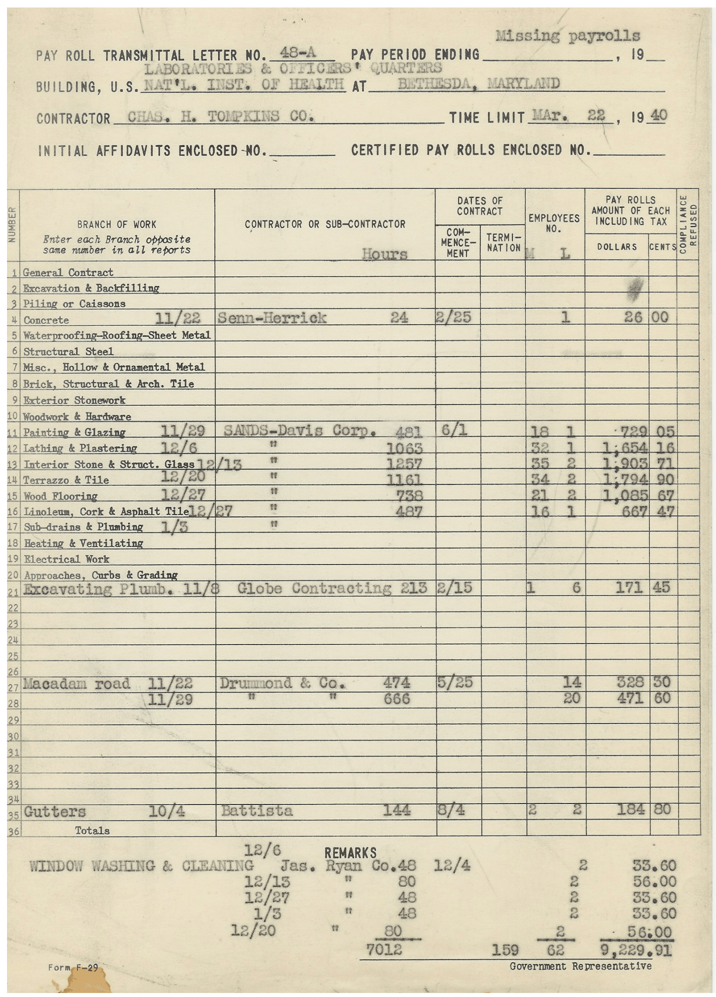
Office of NIH History

F. Bruyninck Studio cornice work

Where possible, local companies were used in the construction process. These cornice models were submitted for approval by the F. Bruyninck Studio, which was located on Newton Street, N.W. in Washington, DC. The models were approved by the NIH Construction Engineer on April 12, 1938.

Payroll for the Charles H. Tompkins Co., March 22, 1940

Each contractor submitted payroll sheets for every day of work done, listing the kinds of workers on the site, their hours, and their wages. Workers were paid the minimum wage for their type of work. Per hour, bricklayers were paid $1.75, carpenters made $1.62, electricians took home $1.80, painters were paid $1.57, and sheet metal workers were paid the least at $1.50. Apprentices in all trades were paid less.



Missing payrolls

PAY ROLL TRANSMITTAL LETTER NO. 48-A PAY PERIOD ENDING ______, 19__

BUILDING, U.S. LABORATORIES & OFFICERS' QUARTERS NAT'L. INST. OF HEALTH AT BETHESDA, MARYLAND

CONTRACTOR CHAS. H. TOMPKINS CO. TIME LIMIT MAr. 22, 1940

INITIAL AFFIDAVITS ENCLOSED NO. ______ CERTIFIED PAY ROLLS ENCLOSED NO. ______

NUMBER	BRANCH OF WORK *Enter each Branch opposite same number in all reports*	CONTRACTOR OR SUB-CONTRACTOR Hours	DATES OF CONTRACT COM-MENCE-MENT	TERMI-NATION	EMPLOYEES NO. M L	PAY ROLLS AMOUNT OF EACH INCLUDING TAX DOLLARS	CENTS	COMPLIANCE REFUSED
1	General Contract							
2	Excavation & Backfilling							
3	Piling or Caissons							
4	Concrete 11/22	Senn-Herrick 24	2/25		1	26	00	
5	Waterproofing-Roofing-Sheet Metal							
6	Structural Steel							
7	Misc., Hollow & Ornamental Metal							
8	Brick, Structural & Arch. Tile							
9	Exterior Stonework							
10	Woodwork & Hardware							
11	Painting & Glazing 11/29	SANDS-Davis Corp. 481	6/1		18 1	729	05	
12	Lathing & Plastering 12/6	" 1063			32 1	1,654	16	
13	Interior Stone & Struct. Glass 12/13	" 1257			35 2	1,903	71	
14	Terrazzo & Tile 12/20	" 1161			34 2	1,794	90	
15	Wood Flooring 12/27	" 738			21 2	1,085	67	
16	Linoleum, Cork & Asphalt Tile 12/27	" 487			16 1	667	47	
17	Sub-drains & Plumbing 1/3	"						
18	Heating & Ventilating							
19	Electrical Work							
20	Approaches, Curbs & Grading							
21	Excavating Plumb. 11/8	Globe Contracting 213	2/15		1 6	171	45	
22								
23								
24								
25								
26								
27	Macadam road 11/22	Drummond & Co. 474	5/25		14	328	30	
28	11/29	" " 666			20	471	60	
29								
30								
31								
32								
33								
34								
35	Gutters 10/4	Battista 144	8/4		2 2	184	80	
36	Totals							

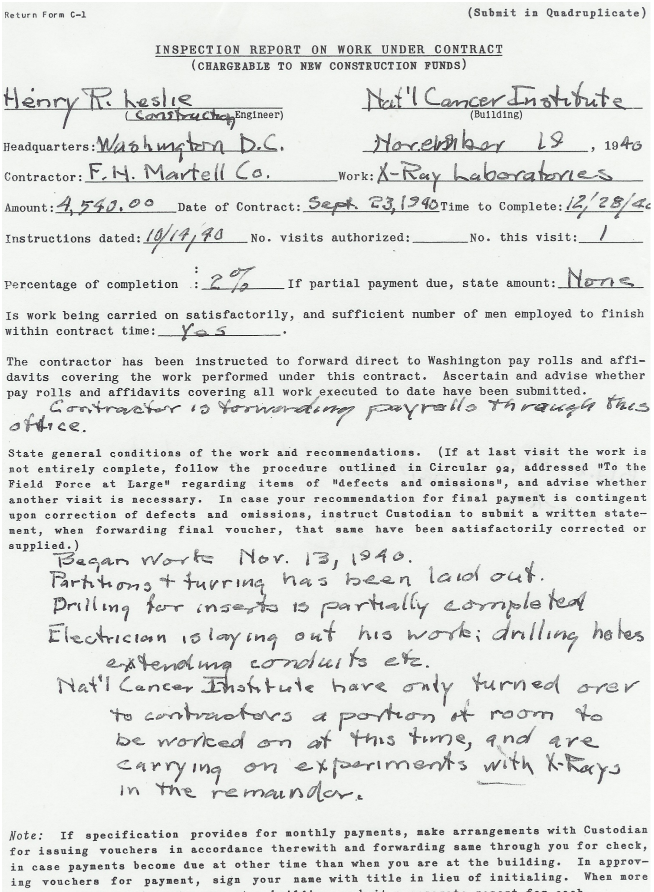
REMARKS

WINDOW WASHING & CLEANING	12/6	Jas. Ryan Co.	48	12/4	2	33.60
	12/13	"	80		2	56.00
	12/27	"	48		2	33.60
	1/3	"	48		2	33.60
	12/20	"	80		2	56.00
			7012	159	62	9,229.91

Government Representative

Form F-29

Office of NIH History



Return Form C-1 (Submit in Quadruplicate)

INSPECTION REPORT ON WORK UNDER CONTRACT
(CHARGEABLE TO NEW CONSTRUCTION FUNDS)

Henry R. Leslie (Construction Engineer) Nat'l Cancer Institute (Building)

Headquarters: Washington D.C. November 19, 1940

Contractor: F. H. Martell Co. Work: X-Ray Laboratories

Amount: 4,540.00 Date of Contract: Sept. 23, 1940 Time to Complete: 12/28/40

Instructions dated: 10/14/40 No. visits authorized: ______ No. this visit: 1

Percentage of completion: 2% If partial payment due, state amount: None

Is work being carried on satisfactorily, and sufficient number of men employed to finish within contract time: Yes.

The contractor has been instructed to forward direct to Washington pay rolls and affidavits covering the work performed under this contract. Ascertain and advise whether pay rolls and affidavits covering all work executed to date have been submitted.
Contractor is forwarding payrolls through this office.

State general conditions of the work and recommendations. (If at last visit the work is not entirely complete, follow the procedure outlined in Circular 92, addressed "To the Field Force at Large" regarding items of "defects and omissions", and advise whether another visit is necessary. In case your recommendation for final payment is contingent upon correction of defects and omissions, instruct Custodian to submit a written statement, when forwarding final voucher, that same have been satisfactorily corrected or supplied.)
Began work Nov. 13, 1940.
Partitions + furring has been laid out.
Drilling for inserts is partially completed
Electrician is laying out his work; drilling holes extending conduits etc.
Nat'l Cancer Institute have only turned over to contractors a portion of room to be worked on at this time, and are carrying on experiments with X-Rays in the remainder.

Note: If specification provides for monthly payments, make arrangements with Custodian for issuing vouchers in accordance therewith and forwarding same through you for check, in case payments become due at other time than when you are at the building. In approving vouchers for payment, sign your name with title in lieu of initialing. When more [illegible] contract is under way at a building, submit a separate report for each.

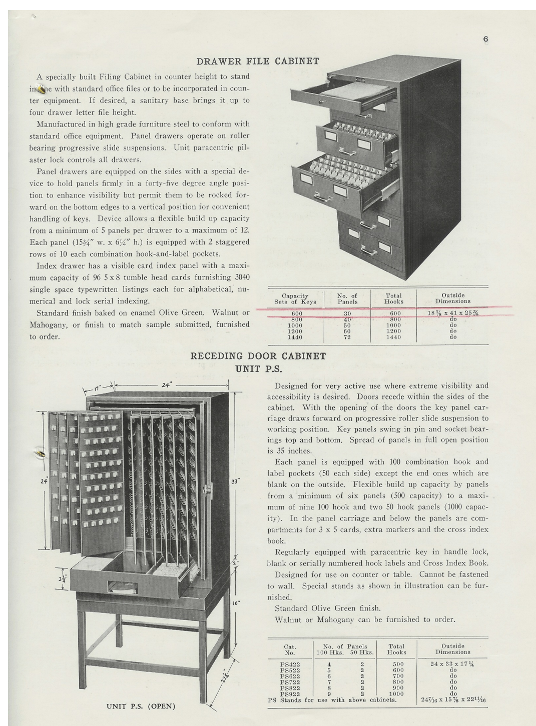
Office of NIH History

Inspection report on work under contract

Dated November 19, 1940, this form reports the progress made by the contractors who were working on the X-ray laboratories for Building 6. Inspection reports kept the project director informed of any potential problems there might be with a contractor meeting deadlines or completing a contract. Contractors were not paid until the work was satisfactorily completed. Note that the scientists in the National Cancer Institute continued their experiments as construction went on around them.

Tell Kee Visible Key Control System pamphlet

Lots of locking cabinets to hold chemicals, supplies, and administrative records as well as the many doors to individual laboratories and offices meant that each building had to have an organized key system. In June of 1939, the Charles H. Tompkins Co. requested permission to use the TelKee Visible Key Control System shown here. The project manager marked the desired model with red ink.



6

DRAWER FILE CABINET

A specially built Filing Cabinet in counter height to stand in line with standard office files or to be incorporated in counter equipment. If desired, a sanitary base brings it up to four drawer letter file height.

Manufactured in high grade furniture steel to conform with standard office equipment. Panel drawers operate on roller bearing progressive slide suspensions. Unit paracentric pilaster lock controls all drawers.

Panel drawers are equipped on the sides with a special device to hold panels firmly in a forty-five degree angle position to enhance visibility but permit them to be rocked forward on the bottom edges to a vertical position for convenient handling of keys. Device allows a flexible build up capacity from a minimum of 5 panels per drawer to a maximum of 12. Each panel (15¾" w. x 6¼" h.) is equipped with 2 staggered rows of 10 each combination hook-and-label pockets.

Index drawer has a visible card index panel with a maximum capacity of 96 5 x 8 tumble head cards furnishing 3040 single space typewritten listings each for alphabetical, numerical and lock serial indexing.

Standard finish baked on enamel Olive Green. Walnut or Mahogany, or finish to match sample submitted, furnished to order.

Capacity Sets of Keys	No. of Panels	Total Hooks	Outside Dimensions
600	30	600	18⅞ x 41 x 25¾
800	40	800	do
1000	50	1000	do
1200	60	1200	do
1440	72	1440	do

RECEDING DOOR CABINET
UNIT P.S.

Designed for very active use where extreme visibility and accessibility is desired. Doors recede within the sides of the cabinet. With the opening of the doors the key panel carriage draws forward on progressive roller slide suspension to working position. Key panels swing in pin and socket bearings top and bottom. Spread of panels in full open position is 35 inches.

Each panel is equipped with 100 combination hook and label pockets (50 each side) except the end ones which are blank on the outside. Flexible build up capacity by panels from a minimum of six panels (500 capacity) to a maximum of nine 100 hook and two 50 hook panels (1000 capacity). In the panel carriage and below the panels are compartments for 3 x 5 cards, extra markers and the cross index book.

Regularly equipped with paracentric key in handle lock, blank or serially numbered hook labels and Cross Index Book.

Designed for use on counter or table. Cannot be fastened to wall. Special stands as shown in illustration can be furnished.

Standard Olive Green finish.

Walnut or Mahogany can be furnished to order.

Cat. No.	No. of Panels 100 Hks.	50 Hks.	Total Hooks	Outside Dimensions
PS422	4	2	500	24 x 33 x 17¼
PS522	5	2	600	do
PS622	6	2	700	do
PS722	7	2	800	do
PS822	8	2	900	do
PS922	9	2	1000	do
PS Stands for use with above cabinets.				24 7/16 x 15⅞ x 22 11/16

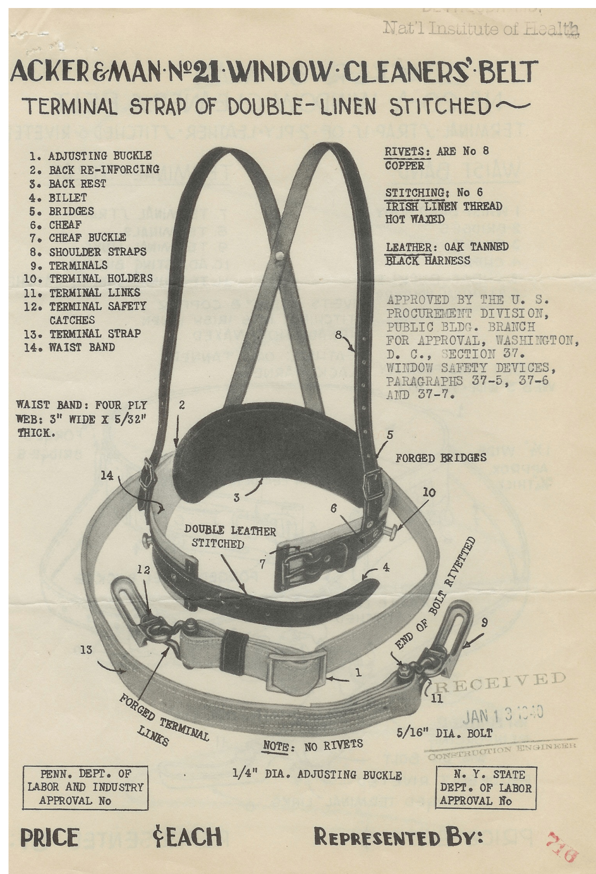
UNIT P.S. (OPEN)

Office of NIH History

Office of NIH History

New Century oil heater brochure

The Public Health officers' quarters got the latest in technology for 1939, including refrigerators, electric irons, and a Century Model J oil burner with automatic controls. The Engineering Corp. of Cedar Rapids, Iowa, which made the Model J, boasted: "Century Model J is so compact and attractive and eliminates forever the dirty space formerly need for coal storage, you can easily arrange your basement into a livable play or work room. It's like adding another room to your home...but at no extra expense."



Office of NIH History

Acker & Man, Inc. Window Cleaners' Safety Belt

The Division of Industrial Hygiene investigated ways to protect workers' safety and health and tried to practice what it preached. The No. 21 Window Cleaner's Belt from had to be presented with three copies of its safety certificate. It was used by workmen on Buildings 4 and 5 in 1940.

CHAPTER 3: THE PRESIDENT COMES TO BETHESDA: OCTOBER 31, 1940, DEDICATION CEREMONY

With the National Institute of Health (NIH) campus in its final stage of construction, Wayne Coy, Acting Federal Property Administrator, wrote to President Franklin Roosevelt suggesting that Roosevelt perform a simple ceremony to dedicate the Institute. "It seems to all of us that in this time of our great efforts toward military preparedness, that it would be most appropriate for you to bring to the attention of the people of the country the fact that peacetime preparedness against diseases is not being neglected," he advised (letter to President Roosevelt, dated October 15, 1940).

Two weeks later, on October 31, 1940, Roosevelt stood between the white columns on the front porch Building 1 to dedicate the campus. An estimated 3,000 public and private doctors, Public Health Service (PHS) employees, and Montgomery County residents attended the ceremony on the warm afternoon. Roosevelt's brief speech made three points. First, with the United States closely watching the war in Europe, Roosevelt stressed that total defense meant not only guns and airplanes, but mobilization of health and medical resources. He stated that the NIH had been devoted to "furthering the health of all mankind." Its new mission, he declared, must be to "recruit not only men and materials but also knowledge and science in the service of national strength."

Second, Roosevelt emphasized that "neither the American people nor their government intend to socialize medical practice any more than they plan to socialize industry." This was Roosevelt's strongest statement up until that time trying to calm the organized medical profession. Some feared that Roosevelt would establish a national health care system administered by the federal government. The American Medical Association strongly opposed any such plan. "No one has a greater appreciation than I of the skill and self-sacrifice of the medical profession. And there can be no substitute for the personal relationship between doctor and patient which is characteristic and a source of strength of medical practice in our land," Roosevelt assured his audience.


Office of NIH History

And third, Roosevelt lauded the Public Health Service, saying, "it is only recently in the past few years that the Federal Government has indicated that it can do infinitely more–that disease disregards state lines as well as national–that among the States there is inequality of opportunity for health–that in such cases the Public Health Service is helping, and must continue to help, man greatly." Roosevelt highlighted the establishment of the National Cancer Institute and warned that better transportation around the world meant more exposure to all kinds of disease.

At the end of his speech, Roosevelt turned to Helen Wilson and thanked her family for the donation of their land for the NIH. He told her, "I voice for America, and for the stricken world, our hopes, our prayers, our faith, in the power of man's humanity to man."

Gallery: The Dedication Ceremony

National Library of Medicine

A crowd gathers on the lawn of Building 1 for the ceremony.

The Navy Band provided music.

National Library of Medicine

Office of NIH History

President Roosevelt gave his speech. Note the NBC Radio News microphones; Roosevelt was the first U.S. president to use radio effectively to communicate with the nation.

A Closer Look: President Franklin D. Roosevelt's Speech, Text and Audio

Below is the transcript of the speech that Roosevelt delivered on October 31, 1940, to dedicate the National Institute of Health campus in Bethesda. Following is a link to an audio file of the speech.

> "Ladies and Gentlemen:
>
> "Nowhere in the world except in the Americas is it possible for any nation to devote a great sector of its effort to life conservation rather than to life destruction. All of us are grateful that we in the United States can still turn our thoughts and our attention to those institutions of our country which symbolize peace–institutions whose purpose it is to save life and not to destroy it. It is for the dedication of these noble buildings to the service of man that we are assembled here today.
>
> "The National Institute of Health speaks the universal language of humanitarianism. It has been devoted throughout its long and distinguished history to furthering the health of all mankind, in which service it has recognized no limitations imposed by international boundaries; has recognized no distinctions of race, of creed, or of color.
>
> "The total defense that we have heard so much about of late, which the nation seeks, involves a great deal more than building airplanes, ships, guns and bombs. We cannot be a strong nation unless we are a healthy nation. And so we must recruit not only men and materials but also knowledge and science in the service of national strength. That is what we are doing here.
>
> "We have recognized the strategic importance of health by the creation of a health and medical committee in the Council of National Defense whose job it is to coordinate the health and medical aspects of national preparedness. This committee is assisting the [federal] government in the mobilization of the medical and health resources of the country to serve the best interests both of the military and the civilian elements of the nation.
>
> "To do this will require the best energies of the professional and technical leadership of our country. To do this will require the fullest cooperation between the government and the hospitals, the medical, dental, nursing and other professions. We seek the same partnership that we seek of industrial production in the Advisory Commission.
>
> "Neither the American people nor their government intend to socialize medical practice any more than they plan to socialize industry. In American life, the family doctor, the general practitioner, performs a service which we rely upon and trust as a nation. No one has a greater appreciation than I of the skill and self-sacrifice of the medical profession.

And there can be no substitute for the personal relationship between doctor and patient which is characteristic and a source of strength of medical practice in our land.

"Although we have still much to do, the nation today is better prepared to meet the public health program of our emergency that at any previous time in the history of the country. Since the passage of the famous Social Security Act, with its health provisions, in 1935, federal, state, and local health and medicine are cooperating more broadly than ever before. Our people are better informed on health matters than ever before. Scientific knowledge of the causes of disease and also the conditions for health has exceeded any previous limits. Facilities for health and medical service are more numerous and better.

"The Public Health Service is an old institution and has done magnificent work, but it is only recently in the past few years the federal government has indicated that it can do infinitely more–that disease disregards state lines as well as national–that among the states there is inequality of opportunity for health–that in such cases the Public Health Service is helping, and must continue to help, man greatly.

"That partnership, and I emphasize that word in regard to health throughout the land, is making definite progress against many diseases.

"Among the buildings of the National Institute of Health to be dedicated here today stands the National Cancer Institute, created through provisions of the Act which I signed August 5, 1937. The work of this new institute is well under way. It is promoting and stimulating cancer research throughout the nation; it is bringing to the people of the nation a message of hope because many forms of the disease are not only curable but even preventable. Beyond this, it is doing research here and in many universities to unravel the mysteries of cancer. We can have faith in the ultimate results of these efforts.

"These buildings, which we dedicate, represent new and improved housing for an institution which has a long and distinguished background of accomplishment in this task of research. The original demonstration of the cause and method of prevention of pellagra has been followed by other important contributions. Great work has been done in the control of tularemia, Rocky Mountain spotted fever, typhus fever, malaria, and psittacosis.

"Now that we are less than a day by plane from the jungle-type yellow fever of South America, less than two days from the sleeping sickness of equatorial Africa, less than three days from cholera and bubonic plague, the ramparts we watch must be civilian in addition to military.

"For the spacious grounds on which these buildings stand we are indebted to Mr. and Mrs. Luke I. Wilson, who wrote me in 1935, asking if part of their estate at Bethesda, Maryland, could be used to the benefit of the people of this nation. I would tell her now as she sits beside me that in their compassion for suffering, their hope for human action to alleviate it, she and her husband symbolized the aspirations of millions of Americans for a cause such as this.

"Today the need for the conservation of health and physical fitness is greater than at any time in the nation's history. In dedicating this Institute, I dedicate it to the underlying philosophy of public health, to the conservation of life, to the wise use of the vital resources of our nation.

"I voice for America, and for the stricken world, our hopes, our prayers, our faith, in the power of man's humanity to man."

Audio file of President Franklin D. Roosevelt's Dedication Speech

CHAPTER 4: SCIENCE AND THE 70 ACRES

In the 1930s, a new government approach to public health was developing in the United States–one that addressed the causes of disease through laboratory science and that treated the health of the citizenry as a basic interest of government. These changes bore the imprint of President Franklin Roosevelt's programs for social reform and the increasingly pressing need to prepare for war. For the National Institute of Health (NIH), the emphasis on public health and laboratory science led to a new commitment to basic science and chronic disease research in addition to the NIH's traditional focus on epidemic control and sanitary engineering. The NIH's move to Bethesda, Maryland, was a physical manifestation of its increasing responsibilities.

In 1935, the average life expectancy for whites was 63 years old; for blacks, 53 years old (National Center for Health Statistics, *National Vital Statistics Reports*, Vol. 52, No. 3, Sept. 18, 2003). Research into viral diseases was new; many diseases we now define as viral were mysterious in origin and specific methods to control the spread of viruses were undeveloped. Investigations into diseases caused by bacteria and parasites were only one generation old. There were no antibiotics available. There were no vaccines for many common childhood diseases, blood transfusion did not exist, and most heart conditions were not well understood. Cancer was on the increase. Dental problems affected almost everyone, with most people losing several teeth over their life. Air and water pollution were increasing. Hospitals were used mainly by people requiring surgery or those with no family to nurse them. There was little preventive care or public education about health issues.

In 1937, *The Washington Evening Star* reporter Lucy Salamanca wrote:

> "Poliomyelitis, epidemics better known as infantile paralysis, leaving in their wake armies of helpless and crippled children; invasions of unnamed and terrifying disease that decimate entire communities; the failure of the human heart to function; the slow decay of the human lungs; the merciless advance of cancerous growths; typhus, typhoid, influenza, tuberculosis, and an almost countless army of human ills and ailments–these are the things that pull us up straight in our chairs as we read. It is control of such forces that means everything to us."
> ("Careless of Safety, They Live or Die for Human Protection Against Deadly Disease With Heroic Honor Roll," Lucy Salamanca, *Washington Evening Star*, February 21, 1937, F1.)

The late 1930s and early 1940s saw the beginning of an explosion of medical research. This explosion was ignited by the federal government's support, propelled by the development of new technology, and sustained by the sheer hard work and sacrifice of scientists and technicians. A snapshot of some of the research in progress at the NIH during the late 1930s shows a small staff producing significant results.

Division of Biologics Control

The Division of Biologics Control under Senior Surgeon Walter T. Harrison tested commercial products and developed new products of therapeutic value such as antitoxins and vaccines, standardizing their content. These studies included basic research into the structure of toxins, clinical trials of vaccines, establishing strains of bacteria, and licensing companies for interstate sale of biologic products.

Items needed to test vaccines
National Cancer Institute

From 1938 to 1940, clinical trials of an alum precipitated pertussis (whooping cough) vaccine were being carried out. Three types of smallpox vaccine were investigated to see which growth medium was most effective–calf skin, tissue culture, or chick embryo. This study resulted in a withdrawal of the vaccine grown in chick embryos. Other studies were done on arsenical preparations and sera and vaccines for tuberculosis, pneumococci, diphtheria, tetanus, *hemophilus influenzae* (a bacterium causing severe illness), meningitis, rabies, gas gangrene, and botulinus.

With the discovery of sulfa drugs in 1935, new treatments were on the horizon. In 1937, the Division's Drs. Sanford M. Rosenthal, Hugo Bauer and Sara E. Branham investigated sulfonamide as a treatment for bacterial infections. Dr. Margaret Pittman showed in 1939 that sulfapyradine was effective against non-type specific *Haemophilus influenza* bacterium.

An Epidemic of Meningitis
The Division's work during the meningitis epidemic of 1935-1937 demonstrates that the scientists did much more than test sera and vaccines (a serum is the fluid containing antibodies obtained after separating the blood from immunized animals into solid and liquid parts; a vaccine is created from the weakened or killed bacteria or virus itself to stimulate antibodies). Branham's group, which included Pittman and Elsie M. Sockrider, was put in charge of investigating the epidemic. They studied the geographic distribution of the illness and found that many different strains of meningitis were involved. After proving that "few commercial sera contain specific antibodies for Type II meningococci" *(Annual Report of the Surgeon General of the United States for the Fiscal Year 1938*, Treasury Department Document No. 3094, U.S. Government Printing Office, Washington, 1938, page 44), Branham's group strove to ensure that commercial sera represented all types of meningococci. Because meningitis mutated quickly into different strains, the group prepared type strains, frozen and vacuum sealed, to distribute to laboratories preparing meningitis sera.

Branham's group also studied meningococci to develop a new serum–current sera were developed in horses which was slow and expensive. In doing this research, the scientists developed a new test for the potency of meningococcus sera. They had used mice to test the potency of a lot of sera, but then they found that a residue called a precipitate formed when they added meningococci to a gel which had serum in it. The amount of the precipitate that was formed from this reaction was directly related to the potency of the serum.


Branham and technician Robert Forkish perform the mouse protection test
National Library of Medicine

In addition to tracking the epidemic, testing commercial sera, and discovering new serum development methods, Branham's group studied the therapeutic effects of the drugs sulfanilamide and sulfapyridine on mice infected with meningococcus. They hoped to find a new treatment for humans. This quest was painfully personal for the NIH scientists. In December 1935, laboratory assistant Anna Pabst was inoculating a rabbit with meningococcus when the rabbit hopped, causing some of the culture to shoot into her eye. Though her eye was washed with antiseptics, Pabst died four days later of meningitis.

Division of Chemistry

Led by one of the founders of carbohydrate chemistry, Claude S. Hudson, the Division of Chemistry in the late 1930s focused on researching carbohydrates, fluoride and dental caries, and nutrition. As stated in the 1939 report *Studies of the National Institute of Health*, "The purpose [of the carbohydrate studies] is to obtain fundamental information that discloses the chemical structure of sugars and their derivatives, and of more complex carbohydrates, such as starch, glycogen and insulin. The relationship of these studies to the subject of public health is that they provide a necessary basis for the scientific understanding of the chemical processes involved in nutrition" (U.S. Public Health Service, Washington, page 7). Nutrition investigations included studies on nutrition's role in pellagra, black tongue (a discoloration of the tongue), and dental caries. Vitamin C and B complex studies were conducted along with investigations into low protein diets.

Riboflavin: Vitamin B-2
In 1939, the Division's Drs. William Henry Sebrell and Roy F. Butler published the first clinical description of ariboflavinosis, a human riboflavin deficiency. Until this investigation, it was thought that the symptoms were related to pellagra, a disease caused by a deficiency of niacin (vitamin B) in the diet. Pellagra had been identified as a nutrition deficiency disease by the NIH's Dr. Joseph Goldberger in 1914. But in 1938, Sebrell suggested that riboflavin deficiency "might occur simultaneously with, or independently of, pellagra" ("Riboflavin Deficiency in Man (Ariboflavinosis)," *Public Health Reports*, Vol. 54, No. 48, December 1, 1939, page 2121).

William H. Sebrell
National Library of Medicine

Sebrell and Butler investigated this hypothesis by putting 18 white women in an institution on a special diet composed mainly of cornmeal, lard, corn syrup, and tomato juice with cod liver oil. All but one of the women eventually developed symptoms of lesions on the lips, cracks in the corners of the mouth, and accumulations around the nose. Sebrell gave some of the women niacin supplements but their symptoms continued unabated and worsened. He then gave all of the women riboflavin supplements: their symptoms disappeared. Sebrell had discovered a separate deficiency disease, one caused by a lack of riboflavin (vitamin B-2) in the diet.

Riboflavin is critical to the body's defense system and important in making necessary hormones. It can be found in dairy products, almonds, green vegetables, and some meats. A deficiency in riboflavin can lead to weakness; sore throat; mouth lesions; dry mucus membranes in the mouth, eyes, and genitalia; anemia; and blurred vision and light sensitivity. In 1941, largely because of Sebrell and Butler's work, the United States began a riboflavin enrichment program for wheat. Today most cereals are enriched with riboflavin. Sebrell became NIH director in 1950.

Fluoride: Too Much and Too Little

Dental problems were a major health issue. In the 1940s, most people could expect to be nearly toothless by the time they were 45 years old. Dental problems caused pain, illness, and a national security concern when thousands of men were kept from military duty because of the state of their teeth.

Mottled teeth
National Library of Medicine

Little was known about dental conditions, but investigations had begun. In the late 1920s, researchers investigating a phenomena called "Colorado Brown Stain" discovered that high levels of fluoride in drinking water stained teeth but also made them resistant to decay. In the early 1930s, Dr. Henry Trendley Dean, the NIH's only dentist, began analyzing water samples around the country to further investigate this observation. He asked his colleague Dr. Elias Elvove in the Division of Chemistry to develop an accurate test for the amount of fluoride in water, which Elvove did. By 1936, Dean had used Elvove's test to determine the amount of fluoride in water that would not cause mottled teeth (1.0 parts per million). In 1938, Dean completed a survey of 3,300 school children in South Dakota, showing that where fluoride content in the water was higher, the children had less tooth decay. In 1939 and 1940, samples of water from all over the country were analyzed in an attempt to correlate the fluoride content of the water with the incidence of dental caries.

Not until 1944 was Dean ready to test his theory that adding safe levels of fluoride to municipal water supplies would decrease dental caries. In that year, the city of Grand Rapids, Michigan, became his testing ground by adding fluoride to its water supply. Dean's work led to the addition of fluoride to community water systems all over the United States to prevent dental caries. But the Division of Chemistry was also looking into how to get fluoride out of water for those towns and cities whose water supplies had an over-abundance of fluoride. In 1938, the Division reported that magnesium oxide could be used to remove unwanted fluoride from water systems.

New Pain-Killers
Drs. Lyndon Small and Nathan B. Eddy joined the Division of Chemistry in 1939 to look for substitutes for the pain-killer morphine, which is made from opium derived from poppy plants. They wanted to develop a pain-killer that was neither addictive nor dependent upon foreign sources. Small prepared hundreds of opiate compounds and Eddy evaluated them for effectiveness and addictiveness. For more on their work, see the exhibit at http://history.nih.gov/exhibits/opiates/index.html

Small's cigar box of drug samples
Office of NIH History

Division of Industrial Hygiene

In the late 1930s, Senior Surgeon Royd Ray Sayers' Division of Industrial Hygiene was a busy place. The Division conducted field investigations, laboratory research, and provided training services across the country. The scientists developed their own tests and instruments to measure contaminants, invented protective equipment for workers, and published safety procedures and rules. Truck drivers, workers in the storage and battery industry, and those in the "dusty" trades like pottery-making, stone-cutting, and mining were some of the workers whose occupational health were investigated.

For example, in 1939, after studying manufacturing processes and skin hazards, the Division's Dr. Louis Schwartz and Dr. Harry R. Foerster of Milwaukee described industrial dermatitis and melanosis. Industrial dermatitis is redness, itchiness, cracking, and blistering of the skin caused by substances used at work (particularly tar). Melanosis occurs when a pigment metabolic disorder forces the skin pigment melanin to collect into one spot. Schwartz and Foerster's work led to procedures for protecting workers' skin. The Division also studied the hazards of agricultural work, investigating the effects of the spray insecticide lead arsenate on orchard workers and analyzing washed and unwashed apples for lead and arsenic. In this regard, the NIH began the work now overseen by the Occupational Safety and Health Administration and the Environmental Protection Agency.

The Division received added emphasis from NIH Director Lewis Thompson, whose background was industrial hygiene. Thompson considered industrial hygiene to be the core of public health activities in the future as sanitation efforts had been in the past. To this end, the Division supported the development of industrial hygiene units in state and local departments of health by helping them to organize, setting up studies, and giving local public health officers training in industrial hygiene methods.

The Division's statistical sections compiled and analyzed data on disabling illness and injury from specific occupations like railroad workers, or analyzed data from hundreds of thousands of different workers. They calculated the work days lost to illness or injury, how many people were out sick on any given day, and the death rates of different occupations. Their goal was to give the government an idea of the overall health of American workers and the health problems industries faced. The health of the nation's workers would be important in maintaining the United States' industrial strength during wartime.

More than other divisions of the NIH, the Division of Industrial Hygiene had to invent many of its research instruments. Below are some examples of the Division of Industrial Hygiene's research that required new instrumentation.

The Mad Hatters

Mercury poisoning had long been a problem for the hat industry–and during the 1930s most people wore hats. Hat makers used mercury salts in the felting process of matting together the wool fibers they used as hat material. Mercury poisoning can cause poor coordination, tremors, and personality changes which can sometimes make a person with mercury poisoning appear mentally ill–hence the phrase "mad as a hatter." In the 1930s, Dr. Sanford M. Rosenthal developed sodium formaldehyde sulphoxy as a treatment for mercury poisoning. This treatment degraded the mercury into less toxic compounds and was used widely before the advent of dimercaptoethanol as a treatment. He was helped in his studies by the Division's development of a method to measure mercury in the air and spectrographic ways to measure mercury in the urine.

Sanford Rosenthal
National Library of Medicine

In 1940, the Division issued a Public Health Bulletin that described the medical and laboratory findings of their studies of felt hat makers. Using their air measurement method, the Division's scientists had determined that an exposure of less than 1 mg of mercury per 10 cubic meters of air did not result in symptoms, but that any higher concentration would cause signs of poisoning to appear. They also recommended methods to control and prevent mercury poisoning.

Truck Drivers and Fatigue

In 1938, the scientists constructed a portable colorimeter to obtain accurate readings of how much carbon monoxide was in the blood. They used the colorimeter during studies of truck drivers.

This research began as a fatigue study of reaction time, reaction-coordination time, speed of eye movement, and manual steadiness. The researchers developed a composite score to classify each driver's response in these categories. Not surprisingly, they found that the longer a driver had driven, the less he responded in these four categories. These studies were used to establish laws for how long truck drivers could drive.

In 1940, the study began to look at biological aspects of truck driving by examining the white blood cell count, the hemoglobin content of the blood, the acidity of urine, and the total base and potassium concentration of the blood serum of truck drivers. "No occupational disease was found associated with truck driving, although such findings as tremor, blood-shot eyes, leucocytosis [elevated white blood cell counts], and defective vision were frequently observed" (*Annual Report of the Surgeon General of the United States Public Health Service for Fiscal Year 1940*, Federal Security Agency, Document No. 2, U.S. Government Printing Office, 1941, page 58).

Division of Infectious Diseases

The Division of Infectious Diseases, led by Senior Surgeon Rolla E. Dyer, researched a wide range of diseases caused by bacteria, viruses, and fungi. The 1938 annual report of the Surgeon General details over 31 diseases or conditions under investigation–many because states had asked the NIH for help with outbreaks. Some of the Division's research highlights in the late 1930s are described below.

Rickettsial Diseases

Rickettsial diseases are caused by tiny bacteria which have a property usually associated with viruses: they live only inside cells. Many types of rickettsiae infect animals; ticks, lice, and mites transmit the bacteria to people. Some rickettsial diseases are mild, but others can have a fatality rate of nearly 100 percent. There are three basic groups of rickettsial diseases: spotted fevers, typhus, and that ubiquitous category of "other" (many diseases classified as rickettsial in 1938 have been reclassified in different genera today).

Rocky Mountain spotted fever (RMSF–one type of rickettsial spotted fever) is an acute infection that appeared in the Bitterroot Valley of Montana in the early 1900s. The NIH (then called the Hygienic Laboratory) was asked to investigate what caused the disease, which hardly anyone survived. During the next several years, through research that cost five scientists their lives, the cause of and a vaccine for RMSF was discovered.

The RMSF vaccine was developed in 1924 by Dr. Roscoe R. Spencer, a physician at the Hygienic Laboratory, and Dr. Ralph Parker, an entomologist at the state of Montana's Rocky Mountain Laboratory (in 1931, Congress authorized placing the Rocky Mountain Laboratory in the NIH's Division of Infectious Diseases). The vaccine was made by grinding up ticks infected with

Dr. R.R. Hayward vaccinated people in Darby, Montana against RMSF
Office of NIH History

RMSF–a laborious process. A better, reliable way to grow rickettsiae in quantity was sought. In 1938, Dr. Herald R. Cox discovered that rickettsiae could be cultivated plentifully in the yolk sacs of chick embryos, revolutionizing the vaccine-making process. By 1940, yolk sac-produced RMSF vaccine had been tested on people and found safe.

The yolk sac method of making vaccine was applied to other diseases and led to mass production of vaccines for Q fever and epidemic, louse-borne typhus. The method was successful so quickly that in 1940, the Division shipped forty liters of typhus vaccine to Hungary and Romania for use in refugee populations. Viruses grown on other membranes in chick embryos were used to produce new vaccines for influenza, mumps, and yellow fever, among other diseases. In 1939, Dr. Norman Topping developed a treatment for RMSF using hyperimmune rabbit serum–the first successful treatment for the disease, although the serum was expensive and was eventually replaced by antibiotics.

The increase of endemic, flea-borne typhus (the second major rickettsial disease category) during the 1930s, particularly in the South, concerned the Division. To understand the cause of the outbreak and control its spread, researchers studied the animals in the outbreak area to see which ones were a reservoir for the disease. They discovered that 11 species of rodents could harbor the virus for longer than five months. Even a rodent species that was not previously thought to be infected by typhus was discovered to be infected. The studies led the states involved to begin rodent eradication programs to destroy the animal reservoir of the disease. In addition to identifying the vector of the disease, the scientists improved laboratory methods to diagnose typhus using samples from typical and atypical cases of typhus.

In 1938, Drs. Cox and Gordon E. Davis identified a new rickettsial disease they called Nine Mile fever, which caused flu-like symptoms. Nine Mile fever fell into the "other" category of rickettsial diseases. Dyer showed that the organism causing Nine Mile fever was related to that causing Australian Q fever (which had also recently been described) and Bengtson later confirmed that they were in fact the same organism. Cox was honored for his discovery by having the organism responsible for Q fever named after him: *Coxiella burnetii*.

Polio Research
Still a relatively new field in the late 1930s, viral research included choriomeningitis, poliomyelitis (polio), influenza, tuberculosis, and equine encephalitis. Perhaps best known for necessitating the use of "iron lungs" and crippling President Franklin Roosevelt, polio (sometimes called infantile paralysis) was the first viral disease studied at the NIH, starting in 1911.

Investigations were hindered by a lack of convenient, cheap experimental animals. In 1939, Dr. Charles Armstrong adapted the Lansing strain of human poliomyelitis (named after the Michigan city where that particular epidemic of polio occurred) to cotton rats and then to laboratory mice, the first time that a human disease was adapted to an animal which did not naturally get the disease. This breakthrough provided investigators with an inexpensive experimental animal for polio studies on a large scale. Two other strains of polio were also adapted to mice, speeding the creation of a polio vaccine.


Charles Armstrong
National Library of Medicine

Heart Disease
It may seem strange that the Division of Infectious Diseases was concerned with what we now consider a chronic condition. The Division's heart disease research emerged from a national survey on the incidence of rheumatic heart disease in 1936. The survey found that in cities like Philadelphia rheumatic heart disease caused more deaths in children and teenagers than whooping cough, measles, meningitis, diphtheria, scarlet fever and polio combined.

A streptococcal infection (like the one which causes strep throat) causes rheumatic heart disease by damaging valves in the heart. At the time, though, the Division's scientists were not certain that rheumatic fever was associated with streptococcal infections. They tested to see if some misfortune of physiology or metabolism or hormonal or nutritional deficiency was the cause. They conducted clinical and laboratory studies seeking an inherited predisposition to rheumatic fever and tried to develop animal models to study heart lesions. In 1938, working with the Office of Vital Statistics and the American Public Health Association, the Division succeeded in making rheumatic fever a reportable cause of death in the United States. By requiring doctors to report when rheumatic fever caused a death, more accurate statistics for epidemiological studies became available. A clearer picture of where the disease struck, during what season, and who was affected emerged from this work.

But the cause of rheumatic heart disease remained unknown, with the Division's annual report of 1940 declaring: "Investigations to date have afforded no proof of the presence of a virus in the etiology of rheumatic fever" (*Annual Report of the Surgeon General for the Fiscal Year 1940*, Federal Security Agency, Document No. 2, Government Printing Office, Washington, 1941, page 66). Without knowing what caused the disease, developing a practical means to deal with it was very difficult, however, this research helped to clarify the clinical picture of this disease and eventually led to treatment with antibiotics.

Leprosy
Another field of study focused on leprosy. Leprosy is a disease that strikes anywhere and anyone although there is a long history of social ostracism of its sufferers. A contagious disease caused by *Mycobacterium leprae*, leprosy affects the skin, nerves, and eyes. It was not until the late

1940s that the causative organism of and an antibiotic treatment for leprosy was developed.

In 1938, Division scientists noted that leprosy had a tendency to spread only in certain Southern states (Florida, Louisiana, and Texas) and that even in those states the areas where the infections occurred were localized. In 1940, they wrote, “Why leprosy found conditions favorable to spread in the Gulf Coast States only, while elsewhere in the country it has tended to self-extinction, remains one of the most baffling, and the most important, of problems presented by the disease.” (*Annual Report of the Surgeon General for the Fiscal Year 1940*, Federal Security Agency, Document No. 2, Government Printing Office, Washington, 1941, page 71). The scientists recommended that public health authorities should not overreact to cases in areas where leprosy was limited and tended not to spread.

Leper colony in Molokai, Hawaii
National Library of Medicine

In Hawaii, the Division’s Leprosy Investigation Station conducted studies into the phases of leprosy and the treatment of patients. They invented orthopedic devices to correct deformities caused by nerve damage, giving people with leprosy more mobility. The scientists used animals to study the role of nutrition in the disease’s development, finding that malnourishment (particularly deficiencies in vitamin B1 and calcium) increased susceptibility. Treating people with oral doses of vitamin B1 did not improve their symptoms, but injecting the vitamin brought some relief from pain to many of the people.

Malaria

Malaria is caused by a parasite (in this case, a microscopic protozoal organism) transmitted to humans via mosquito bites. It causes high fevers and still is a major killer worldwide. Projects to destroy mosquito breeding grounds by such simple means as drainage ditches had decreased the incidence of malaria in the United States in the early 20th century. But in the late 1930s, malaria remained a national health problem and a great concern to those expecting the country to send soldiers overseas to the areas of malaria’s highest prevalence. Although the cause of malaria was known, the only treatment at that time was quinine, for which the United States was dependent on foreign sources–sources which would likely disappear during a war. In 1938, the Division began a study of the drug Atabrine as a treatment.

Spraying to control mosquitos
National Library of Medicine

Physical and biological control of the mosquito was key to reducing malaria. The Division performed engineering studies on materials used to line drainage ditches and on how to prevent erosion of ditch banks. Studies on the efficacy of quarantining and disinfecting planes arriving from South American countries were also conducted. Biological control of mosquitoes included studies on the effects of light, acidity, and other chemical factors on mosquito larvae. Knowing the enemy was important: a monograph on Caribbean mosquitoes was published in 1939, and the classification of mosquitoes in Costa Rica was begun.

Division of Pathology

This division, led by Surgeon Ralph D. Lillie, provided support to other divisions as well as to Marine hospitals, penitentiaries, and Indian Service hospitals. Each year the small staff completed thousands of diagnostic tests, specimen examinations, malignancy analyses, and animal autopsies. The Division's scientists also carried out their own research on pathology techniques, studying the effects of acidity on the staining of tissues in storage and the best procedures and stains for connective tissues.

After the move to Bethesda, the Division found its work increasing. In 1940, the pathologists supported the polio research of Dr. Charles Armstrong in the Division of Infectious Diseases by doing studies of animals to which Armstrong had been able to transfer a strain of human poliomyelitis. They discovered that no matter how the poliomyelitis was introduced, the spinal cord suffered the first damage. In support of other divisions, the pathologists also conducted studies into Rocky Mountain spotted fever, typhus, and malaria, and into the effects of toxic substances such as selenium and fluorine.

Research into pathology techniques continued in Bethesda. For example, in 1940, the Division reported that it had developed a dye mixture composed entirely of domestic dyes to use in the staining of parasites for diagnosing malaria. As the country watched the war in Europe and Asia, this research had an important impetus: to free the United States from a dependency on foreign pathological tools.

Division of Pharmacology

Dr. Carl Voegtlin was not only director of the National Cancer Institute, but, in 1938, was the acting director of the Division of Pharmacology. Like the Division of Pathology, Pharmacology worked with other divisions, especially in the preparation and testing of new therapeutic compounds. The pharmacologists also worked with the Federal Trade Commission, the Food and Drug Administration, and the Bureau of Internal Revenue to present evidence in court cases against producers of harmful potions and extracts.

The Selenium Problem
In the late 1930s, the Division was involved in its own study: the mineral selenium. Selenium occurs naturally in trace amounts in food and was thought to be toxic (it is now known to be important in small amounts in cell metabolism). In 1938, doctors noticed an increase of selenium

poisoning symptoms in people from South Dakota and northern Nebraska where there was more selenium in the soil and therefore in the food. Field studies revealed the sources of selenium to be ubiquitous: grain, vegetables, dairy products, eggs, and meats. By analyzing flour ground locally, the scientists found enough selenium to account for the increased amount of the mineral in the urine of people suffering from selenium poisoning.

The scientists then studied the toxicity, cellular pathology, and functional disturbances resulting from the ingestion of selenium. A question puzzled the researchers: where does selenium go once it gets into the body? By using dye to follow selenium in the body, they found that it was absorbed mainly by the liver and kidney. By watching the effects of selenium on tissue metabolism, they discovered that the oxygen consumption of the liver, kidneys, muscles, and the brain was affected.

In 1939, the Division found that the concentration of selenium in hair is a reliable index of the amount of selenium in the body, providing a diagnostic tool for selenium poisoning. Since the scientists could not find measures to protect against selenium poisoning, they determined safe levels of selenium intake under normal conditions in several species. In 1940, they discovered that the chronic toxicity of selenium was related to dietary protein: if one ate enough protein, one could avoid selenium's damaging effects. Selenium research continued at the NIH for several decades; for more information see http://history.nih.gov/exhibits/stadtman/index.htm

Division of Public Health Methods

Under Surgeon General Thomas Parran's influence, Surgeon Joseph W. Mountin's Division of Public Health Methods focused on the social and economic factors in disease prevention and the development of local public health facilities. The Division's purview included the usual diseases (cancer, tuberculosis, pneumonia, and heart disease) as well as public health problems like child hygiene, stream pollution, milk and food sanitation, and tracking morbidity. The Division's objective was to define health problems (the incidence of diseases, their causes, and their impact) and procedures useful to public health practice in preventing or treating disease.

National Health Inventory

In 1935, an inventory of the state of illness and medical care in the United States was begun in conjunction with the Works Progress Administration. The Division supervised the administration of the survey and analyzed the data. The purpose of the inventory was to record the state of the health of the citizens of the United States in relation to acute and chronic illnesses, physical impairment, and the distribution of medical services. A survey of 2,800,000 people provided detailed information about the social and economic factors bearing on illness and medical care.

Nurse examines New York school children
National Library of Medicine

The Division used the information to publish bulletins on topics as diverse as the prevalence and causes of orthopedic impairments and the degree of crowding and the existence of sanitary facilities in urban houses. Some 10,000 people identified with hearing problems were further examined to measure their hearing loss in relation to their age and gender, clinical history, and pathology of the ear. This information was used to help standardize testing equipment for hearing such as audiometers. The Roosevelt administration cited the results of the survey in its recommendations for the National Health Program, a report dealing with the nation's health needs and outlining a legislative program of action.

Transient girl, 1940
National Library of Medicine

Health of Transients

The Great Depression of the 1930s is well known for spawning a large homeless population. In 1938, public health officials from cities that attracted transient populations requested that the Division do a study to define the health problems from which transients were most likely to suffer. The study looked at the social, economic, administrative, and legal problems as well as medical problems of 13,000 people, about one-third of which were families.

In 1940, the Division began a study in New York state to investigate how public medical care affected communities. Their goal was to determine what medical care was being offered to transients and to people on public assistance, the costs of the care, the volume of services provided, and to evaluate the quality of care and effectiveness of the programs overall.

Defining the Extent of Cancer

Beginning in 1938, the National Cancer Institute (NCI) funded a Public Health Methods study on the number and characteristics of cancer deaths in the United States using records dating back to 1900. The NCI had thought that the incidence of cancer was being underestimated. The results showed that the mortality rates from cancer had been slightly increasing for 20 years, but the increase was not consistent for each region. More people in the northern states, especially in the northeast, died from cancer, although more people in the South had cancer (the researchers thought this was because of the greater prevalence of skin cancer in the South).

Occupational, environmental, familial, racial, dietary, medical and social factors in relation to cancer were investigated as well. In particular, the scientists were looking at what environmental factors could be linked to the increase in lung cancer. The study also covered the reliability of the available treatments for cancer (X-ray and radium therapy) and the cost of the diagnosis, treatment and care of cancer patients.

Access to Health Care

Deaconess Hospital, Great Falls, Montana
National Library of Medicine

One Division study that reflected Parran's New Deal vision was a nationwide survey of health departments, hospitals and clinics. The study aimed to discover where the nation's health resources were located, how they were being used, who had access to them, and how effective they were in dealing with public health issues. The finding that health care varied by region of the country was expected, as was the finding that most people did not have insurance and went to hospitals only for a surgical emergency. But the study also revealed that most hospitals were not directing their limited monetary and personnel resources to the major causes of sickness and death–perhaps because hospital administrators were not trained in public health methods. In addition, there was a dearth of hospitals in the United States. The investigators estimated that at least 270 new hospitals were needed to serve the rural population adequately. Methods for states to use to determine where new hospitals should be located were included in the report. Whether new hospitals were built or not was up to the states.

Children's Health

The health of children concerned the Division for two reasons: children are one of the populations most exposed to illness, and many other conditions–such as dental problems and heart disease–have their origin in childhood.

Like many other divisions of the NIH, Public Health Methods was investigating the problem of dental caries. Dental caries begins when bacteria attack the minerals in the enamel which protect a tooth. If the invasion is not stopped by good dental care, cavities and eventually the loss of the tooth results. From 1937 to 1938, Drs. Henry Klein, Carroll E. Palmer, and John W. Knutson devised a DMF (Decayed, Missing, Filled) Index that became the standard epidemiological tool for studies of children's dental status. One of the first findings using this index as a statistical tool was that dental caries was directly related to tooth age (the older the tooth, the more caries it had), that similar dental problems ran in families, and that girls had a higher rate of caries than boys.

In conjunction with the Division of Infectious Diseases, the Division of Public Health Methods conducted a study into rheumatic heart disease in children. But the Division had a broader goal than just studying one disease: to clarify the types of heart problems suffered by children for easier diagnosis and the development of better treatments. To do this, the researchers used an electrostethograph and electrocardiograph to produce tracings that gave a visual representation of heart activity. If particular tracings could be linked to particular heart conditions, doctors would have an invaluable tool when diagnosing different cardiac conditions. By 1940, electrocardiograph and electrostethograph recordings of nearly 6,000 children had been made and were beginning to be evaluated.

Environmental Hygiene: Clean Milk and Pure Water
Special studies were made over several years on two important causes of disease: tainted milk and polluted water. Milk can transmit several diseases, including typhoid fever and tuberculosis. In 1924, the Division sent Dr. Leslie C. Frank to Alabama to establish milk production control methods, leading to a standard milk production ordinance in Alabama. This set of laws was adopted by many states and communities. To enforce the ordinance, the Public Health Service created the 1927 Milk Code. The Milk Code went through several editions, written by Mr. Abraham W. Fuchs, an NIH sanitation engineer.


National Library of Medicine

Designing pasteurization equipment that could heat milk (including the foam) to a consistent temperature for a long enough time to kill microorganisms was the focus of an experimental laboratory established in 1933. The laboratory relied on a nonpathogenic test organism (an organism that would not make one sick) isolated by Fuchs in 1931. During the late 1930s, the Division published several Public Health Bulletins describing pasteurization tests on temperature and holding time, new designs for protector valves, and air-space heaters to dissipate and heat foam. The scientists also tested whether paraffining the boards for milk containers would prevent the growth of bacteria.

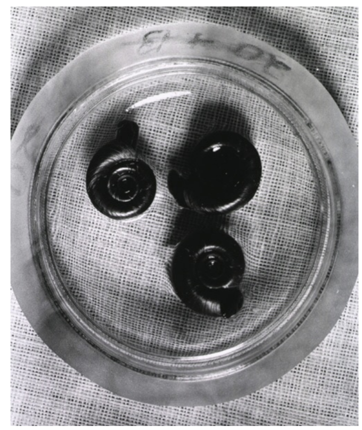
Restoring polluted water and perfecting sewage treatment was important for the environment as well as human health. To see what permanent improvement could be expected in a river when sewage treatment was provided to waste water, the Division monitored river recovery after a new sewage treatment plant was installed in Columbus, Ohio. Along with the United States Army Corps of Engineers, the Division covered 280 miles on the Ohio River between the mouths of the Kanawha and Kentucky Rivers, measuring pollution levels by geographic location. An estimate of the extent and probable cost of recovery measures would follow. The study required four new mobile laboratory units, two new motorboats, and additional personnel. "On its present scale, the survey is by far the most comprehensive one of its kind ever undertaken either in this country or abroad" (*Annual Report of the Surgeon General for the Fiscal Year 1940*, Federal Security Agency, Document No. 2, Government Printing Office, Washington, 1941, page 83).

Division of Zoology

In 1936, Dr. Maurice C. Hall, a veterinarian from the U.S. Department of Agriculture, became the chief of the Division of Zoology. He brought with him Drs. Willard H. Wright, Eloise B. Cram, Myrna F. Jones, and John Bozicevich. The Division initially focused its attention on trichinosis, oxyuriasis, and amebiasis, all parasitic infections which had surmounted sanitation efforts.

Trichinosis: What Causes It and How Do You Detect It?
In 1937, the Division launched a series of studies that demonstrated the extent of human trichinosis in the United States. Trichinosis is caused by ingesting the larvae of a worm called *Trichinella,* usually from undercooked pork or wild game. The infection causes nausea, diarrhea, vomiting, and fever, and may cause heart and breathing problems leading to death. The scientists found that most cases of trichinosis were caused by eating pork from hogs that had been fed garbage (as opposed to grain) with infected pork scraps in it. The problem was especially prevalent in meat that was not government inspected such as that eaten by farmers during hog slaughtering season. The discovery of this major cause of trichinosis led to public calls for farmers to grain-feed instead of garbage-feed hogs and warnings for those preparing pork to cook it thoroughly. Bozicevich stated that one person in six in the United States had a trichina infestation based on postmortem examinations.

In 1938, Bozicevich developed a test for the *in vitro* (outside the body) diagnosis of trichinosis. Trichinosis was difficult to diagnose: the incubation period was highly variable, symptoms varied with the infestation's intensity, and the physical condition of individual patients affected the development of the disease. Previous diagnostic methods depended on physicians listening to case histories, biopsies, or the examination of stool, blood, and cerebrospinal fluid for worms and larvae. A skin test was the most reliable means of diagnosing trichinosis, but positive reactions included itchy wheals on the arm which could persist for several years. Bozicevich's precipitin test did not have such side effects because it took place outside of the body. He mixed serum from a patient with measured amounts of trichina antigen in a small test tubes. A white ring of precipitate would appear where the serum and antigen met if the result was positive, giving an early diagnosis of trichinosis.



National Library of Medicine

During 1940, Bozicevich's method was tested in Puerto Rico and proved to be specific only for trichinosis and not for other parasites, making it a useful diagnostic tool. And Puerto Ricans were found to have a low rate of trichinosis as opposed to Americans.

Pinworms and the NIH Swab
In 1936, Hall developed a reliable diagnostic tool for oxyuriasis (also called enterobiasis) that is still in use today. Oxyuriasis is a pinworm infection, transmitted person to person, causing itchiness in the anal area where the female worm lays her eggs. The diagnostic test for a pinworm infection was to swab the anal area to see if there were any eggs present. Because the eggs did not always show up in the patient's feces or because the swabs were ineffective, the test was unreliable. Hall and his group investigated different swab materials. Cotton entangled the eggs; chamois was difficult to use; rayon let some of the eggs penetrate the cloth and held them. Then the researchers tried scrapers made of matches, metal, wood, and celluloid. Ultimately, Hall devised a special swab made from cellophane, folded into squares, mounted on a glass rod pushed

through a rubber cork in a test tube. The eggs could be counted on the cellophane. Acting as a swab and a scraper, Hall's device could be reused after sterilization with a new cellophane tip.

Using the "NIH Swab," as Hall's device became known, the Division established that pinworms mainly infect children. The Division also tried to determine how to kill pinworm eggs (disinfectants, soaps, and cleansing agents were not effective). Hygienic measures were not enough to prevent the spread of pinworms; this problem was demonstrated by a labor-intensive study at the Jewish Children's Home in New Orleans in 1939. Each child had to take two showers daily, scrub hands and nails with individual nail brushes before meals, and wear tight bloomers under pajamas. The children's night clothing and bedding were sterilized every day in an autoclave and the walls were scrubbed daily with soap and water. The incidence of pinworms actually went up. Wright saw promise only in a new therapy that the NIH was testing using gentian violet tablets with a special coating.

Amebiasis and the Micro-manipulator Isolator
Hall died suddenly in 1938, and Wright became chief of the Division of Zoology. He added new programs and increased the research on amebiasis, caused by the parasite *Entamoeba histolytica*. The parasite passes into humans via the mouth, causing stomach cramping, bloody stools, and fever. For these studies, Dr. Charles Rees developed a special micro-manipulator to isolate cells so that a single species of bacterium could be grown in culture and more easily studied. Rees' micro-manipulator was used in several areas of research.

In 1940, the Division continued researching the incidence and pathogenicity of and diagnostic techniques for amebiasis in a New Orleans, Louisiana, institution for children. It was found that 40 percent of the children had been infected. A diagnostic technique based on centrifuging samples so that the cysts and eggs floated to the top was also tested. Each type of parasite had a specific time it had to be centrifuged. One of the surprise results of the study was that some people had dangerous strains of the parasites which caused infections in others, but not themselves.

Office of Cooperative Studies

The Office of Cooperative Studies, led by Dr. James P. Leake, assisted professional organizations, university research laboratories, and hospitals and medical schools in many kinds of studies. During the late 1930s, the focus was on tuberculosis, with investigations into an antiserum for pulmonary tuberculosis, the incidence and control of tuberculosis among Native and African Americans, and laboratory diagnostic methods. Two other topics received much attention: diphtheria immunization and medical and biological studies of the Eskimo people. The Office of Cooperative Studies later became part of the National Institute of Allergies and Infectious Diseases.


An Indian Health Service field nurse showed a chest X-ray to a Navaho family *National Library of Medicine*

National Cancer Institute

In compliance with the Act of 1937 which created the National Cancer Institute (NCI), the NCI quickly began awarding grants to outside researchers, hiring its own scientists, and organizing its administration. The NCI was created by combining the NIH's cancer research scientists under Dr. Carl Voegtlin and the PHS's cancer unit at Harvard Medical School under Dr. Joseph Schereschewsky. Dr. Carl Voegtlin was installed as director with Dr. Roscoe Roy Spencer as the executive assistant. The National Advisory Cancer Council of scientists and physicians known for their work in cancer helped guide research priorities.

In its first year, the NCI awarded $90,925 in grants to institutions and researchers around the country, with $27,550 going to Harvard University. Research fellows were selected and their training in cancer research began. A new cancer research center was added to the U.S. Marine Hospital in Baltimore, Maryland, for clinical studies. All cases of cancer from the Public Health Service hospitals east of the Mississippi River were to be brought to this clinic for treatment and clinical research (the Clinical Center on the Bethesda campus would not open until 1953).

Another important part of the National Cancer Act was the authorization to design a program to increase physicians' abilities to diagnose and treat cancer. This program was another first for the federal government. It provided "traineeships" to young doctors who had graduated from medical school and completed one-year internships. These new doctors pledged to devote themselves to the speciality of the diagnosis and treatment of cancer. The trainees made $6 a day, the going rate. By summer 1938, the program had 14 trainees enrolled; by 1939, the NCI had several more trainees and fellows in cancer research at the Institute and around the country.

What Causes Cancer?
Certainly one of the biggest questions to answer in controlling the increase of cancer was: what causes cancer? The NCI performed numerous studies in mice into the influence of heredity on the susceptibility to breast and lung cancer. Working with the Roscoe B. Jackson Memorial Laboratory, the scientists also researched non-genetic factors in breast cancer susceptibility, finding that mice of a strain with high susceptibility to breast cancer who nursed from a strain of mice with low susceptibility actually decreased their risk of developing breast cancer.

Drs. Carl Voegtlin and Murray Shear, 1940
National Cancer Institute

But the NCI concentrated on studying what chemicals caused cancer. To this end, scientists investigated how the molecular structure of chemicals might relate to cancer growth. The most important breakthrough in this work was Dr. Murray J. Shear's discovery in 1938, that some chemicals may not cause cancer but can promote cancer growth when used in conjunction with other chemicals.

He observed this when painting mice skin with benzpyrene to try to induce tumors. He used a fraction of creosote with the benzpyrene, and found that the creosote helped the benzpyrene to cause tumors. Shear called such a cancer-enabling substance a “co-carcinogen.”

What is Cancer?

In the late 1930s, very little was known about cellular functions or how enzymes and hormones affect the cells. NCI scientists used *Amoeba proteus* to study the fundamentals of the chemistry of cell division, watching as this one-celled creature divided. The researchers also investigated the role of different enzymes and hormones in normal and cancerous cells and attempted to grow cells in different types of cultures to study them more easily. Drs. Harold L. Stewart and Howard B. Andervont provided the first animal tumor model for gastric cancer in humans, describing the cancer’s pathology and adding to the understanding of carcinogenesis.

Prevention and Treatment

One way to reduce the number of people dying from cancer is to prevent people from developing cancer in the first place. To this end, NCI representatives encouraged states to set up divisions devoted to controlling cancer in their own public health departments. In 1939, seven states began to include cancer control in their health departments’ missions; three states mandated by law the establishment of cancer commissions. The NCI also began a public education effort, distributing an informational folder on cancer and producing a movie with the American Society for the Control of Cancer for non-scientific audiences.

Taking X-rays
National Cancer Institute

In the 1930s, the only treatments for cancer were surgery, radiation, and X-rays. In 1937, the NCI purchased several grams of radium at a cost of $200,000, about half the NCI budget. The Institute kept some for its own research and lent the rest out to about 70 hospitals around the United States. These hospitals used the radium to treat people who could not otherwise afford it. Congress favored this NCI program because it immediately benefitted the American public. Because radium was expensive and in short supply, this program was important to the nation’s hospitals and lasted until the late 1960s.

To study another cancer treatment, a 200-kilovolt X-ray machine with double X-ray tubes was installed in Building 6 in 1940. The machine was important in studies on the treatment of tumors in animals and in research on the effects of X-ray exposure. The double tubes could be used separately or together for high intensity exposure.

Office of NIH History

Portrait of the director and division chiefs of the National Institute of Health, 1938. From left to right: Ralph D. Lillie (Pathology), Walter T. Harrison (Biologics Control), Willard H. Wright (Zoology), Joseph W. Mountin (Public Health Methods), Claude S. Hudson (Chemistry), Lewis R. Thompson (NIH Director), Ludwig Hoektoen (National Advisory Cancer Council), Rolla E. Dyer (Infectious Diseases), Royd Ray Sayers (Industrial Hygiene), and Carl Voegtlin (Pharmacology and the National Cancer Institute).

Division of Biologics Control

National Library of Medicine

Staff of the Division of Biologics Control on the steps of their 25th and E Street building, 1938. Included are Karl Habel, Margaret Pittman, Bernice Eddy, Sarah E. Stewart, and Aneas P. Collins.

The original Science Service caption of September 1937, read: “At the U.S. National Institute of Health in a dust proof room where the filtered air is under slight positive pressure, biological products, such as serums, vaccines and antitoxins, are tested for sterility. Here Technical Assistant E. A. Garlock places the material to be tested in a Smith fermentation tube, the closed arm of which provides for growth under anaerobic conditions.”

National Museum of American History

National Library of Medicine

Dr. Ida A. Bengtson transferred tissue cultures from flasks to culture dishes in 1937, the year she joined the Typhus Unit. She used Dr. Herald Cox's discovery that chick embryo provided a suitable growth medium for rickettsiae to develop a test still in use to detect and differentiate rickettsial infections. Bengston's work on the tissue culture of typhus rickettsiae aided the development of a typhus vaccine, important in World War II. In 1916, Bengtson had become the first woman scientist hired by the Hygienic Laboratory, which became the National Institute of Health in 1930. A senior bacteriologist, she also discovered a new variety of *Clostridium botulinum* (type C) and standardized antitoxins for gas gangrene (tissue death caused by infection with *Clostridium* bacteria).

In this Science Service photograph of September 1937, Drs. Margaret Pittman and Sadie A. Carlin tested commercially prepared anti-meningitis serum for potency during the meningitis epidemic of 1935-1937. Most of the sera were not potent enough. Pittman became one of the first women laboratory chiefs (1957, Laboratory of Bacterial Products), known for her research into respiratory infections and conjunctivitis as well as meningitis.

National Museum of American History

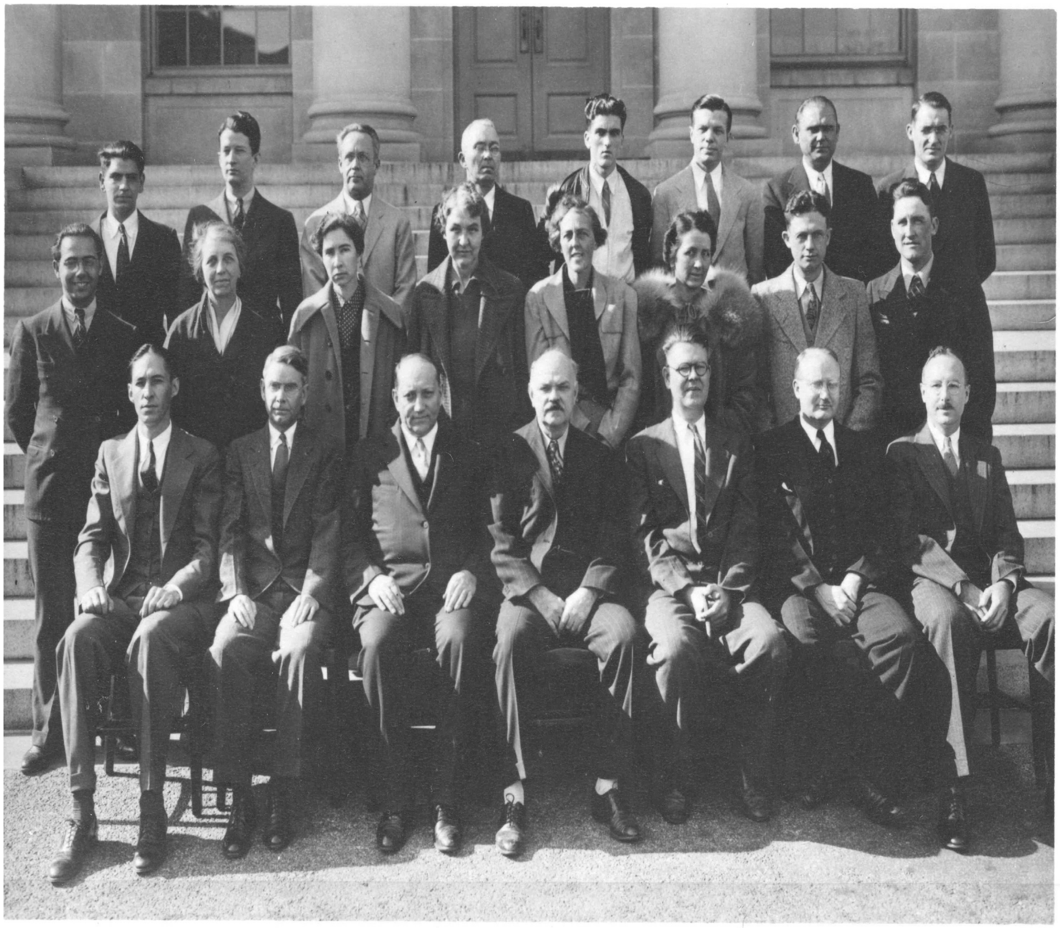
With the development of sulfa drugs in 1935, Rosenthal undertook investigations into sulfanilamide drugs and their use on bacterial infections. The original Science Service caption, May 1938, read: "Dr. Sanford Rosenthal preparing a culture of streptococcus germs with which he will infect a set of test mice. One half of the mice will be treated with sulfanilamide, the other will not. Streptococcus germs cause many human ills, including blood poisoning, septic sore throat, and others." Rosenthal later became chief of the Laboratory of Pharmacology and Toxicology at the National Institute of Arthritis and Metabolic Diseases.

National Museum of American History

National Museum of American History

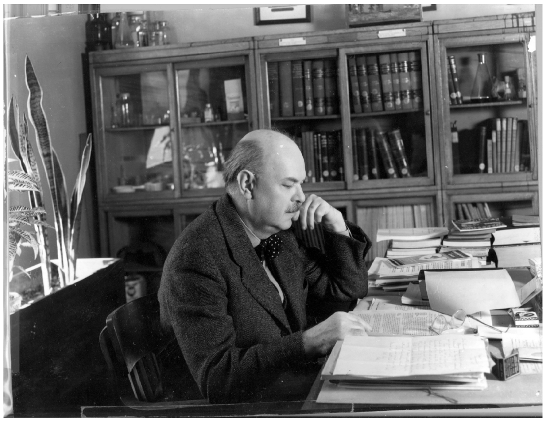
A nurse injected a patient with sulfanilamide as a drug treatment, May 1938. The original Science Service caption read: "Sulfanilamide is administered to human patients either with a hypodermic needle (above) or else in the form of tablets given by mouth. Either way, strict medical supervision is required. Like any other substance that spells death to germs, the new drugs may spell death to humans if they are not handled just right. There is no substitute for skilled medical care: drugs are doctors' allies, not their successors."

Division of Chemistry



Office of NIH History

Staff of the Division of Chemistry on the steps of 25th and E Streets, NW, building, 1939. Front row: Dr. W. Dayton MacLay, Dr. Ernest L. Jackson, Dr. Elias Elvove, Dr. Claude S. Hudson, Dr. Raymond M. Hann, Dr. Havelock F. Fraser, and Dr. Nelson K. Richtmyer. Middle row: Mr. Samuel Dove, Dr. Alice T. Merill, Dr. Allene Jeanes, Dr. Evelyn B. Tilden, Dr. Mildred Adams, Miss Edna M. Montgomery, Dr. Willard T. Haskins, and Mr. Harry W. Diehl. Back row: Mr. Richard Maggenti, Dr. William S. McClenaham, Dr. Frank J. McClure, Mr. Charles G. Remsburg, Mr. Thomas Collins, Dr. Floyd S. Daft, Mr. John T. Sipes, and Dr. Albert E. Knauf.



Office of NIH History

Dr. Claude S. Hudson reading at his desk, c. 1938. Hudson had already established "Hudson's Rules" in carbohydrate chemistry before coming to the National Institute of Health as chief of the Division of Chemistry which he led until 1952. For more on Hudson, see the section "A Closer Look: Scientific Instruments of the 1930s."

National Library of Medicine

Dr. Evelyn B. Tilden at her desk, looking directly at the camera, c. 1938. In 1938, Tilden published a paper about an improved method of preparing the rare sugar ketoheptose perseulose, used in the Division's chemical studies. Avocados were her starting point.

National Library of Medicine

Dr. Elias Evolve conducting water test at his laboratory bench, c. 1938. Elvove was instrumental to Dr. H. Trendley Dean's fluoride investigations, developing a test to accurately measure fluoride in water.

National Library of Medicine

Drs. Floyd S. Daft and Havelock "Frank" Fraser weighed mice, 1938. Daft later became the director of the National Institute of Diabetes and Digestive and Kidney Diseases. Fraser discovered that nicotonic acid could cure black tongue in dogs, the canine equivalent of pellagra. His later work focused on drug addiction.

Division of Industrial Hygiene

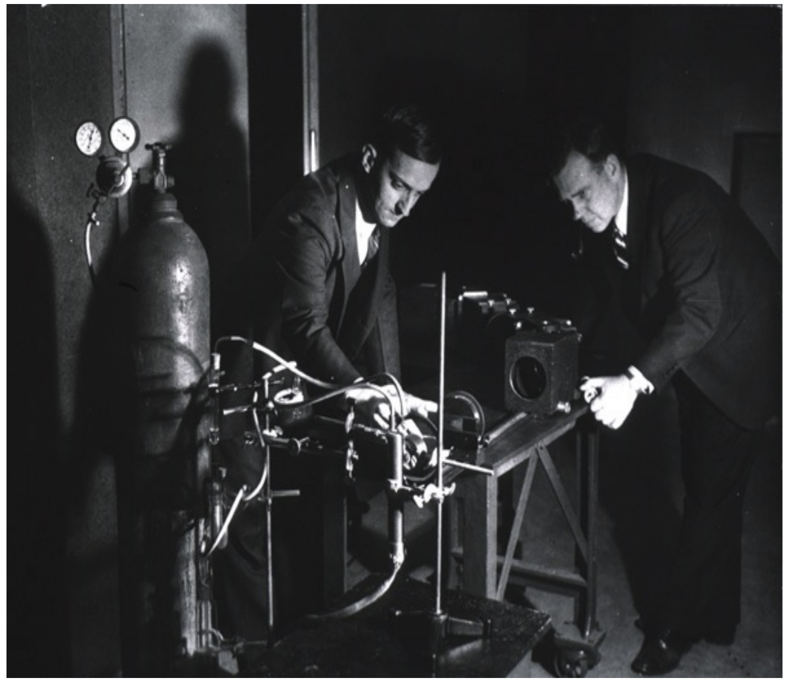
National Library of Medicine

Chief of the Division of Industrial Hygiene, Dr. Royd Ray Sayers, c. 1930s. In the late 1930s, he worked with Lawrence Fairhall to analyze lead poisoning's damage to the body and to try to set a safe limit for lead exposure. He wrote a 1936 report for Congress on the effects of air pollution on health. In 1940, he left the NIH to become the director of the United States Bureau of Mines.

National Library of Medicine

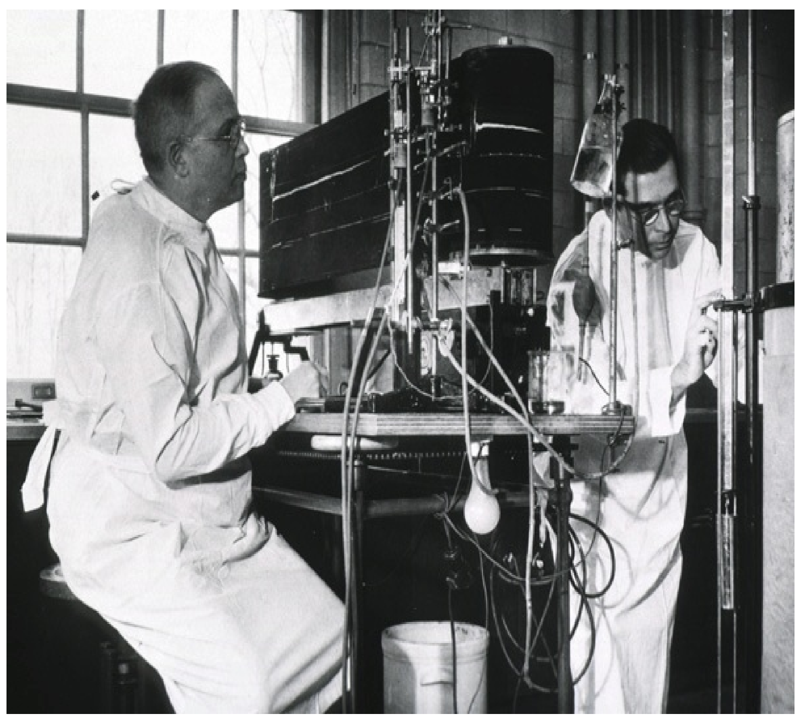
A worker wore asbestos mittens to stack magnesium ingots, circa 1938. The Division investigated factory and agricultural work conditions, recommending improvements to protect workers. As the nation prepared for war during the late 1930s, keeping workers on the job was especially important.

Dr. Peter A. Cole (left) and Dr. Frederick S. Brackett conduct an ultraviolet experiment, 1940. For more about Brackett's work, see his spectrograph in the Scientific Instruments section.



National Library of Medicine

In 1940, Drs. Wolfgang von Oettingen (left) and Dennis Donahue worked with a moving graph to record measurements for an experiment. Van Oettingen's specialty was the pharmacology and toxicology of dyes and solvents. He was the principal industrial toxicologist in the Division, investigating how a chemical's composition related to its pharmacological action.

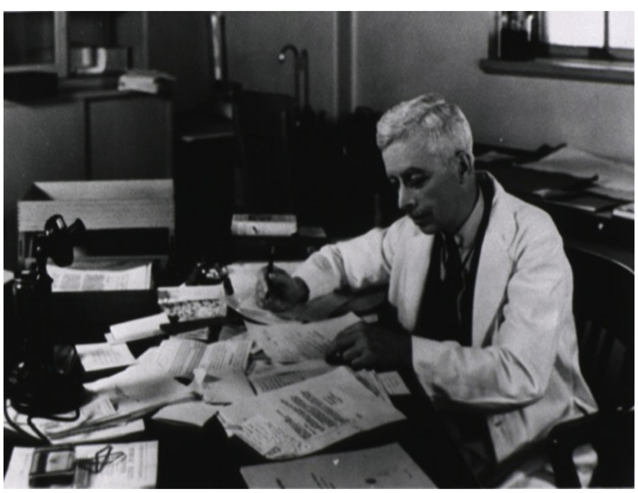


National Library of Medicine

Division of Infectious Diseases

National Library of Medicine

Staff of the Division of Infectious Diseases on the steps of the 25th and E Street, NW building, 1938. Dr. Rolla E. Dyer, the director of the Division, sat in the first row, fourth from the left.



National Library of Medicine

Division of Infectious Diseases director Rolla E. Dyer at his cluttered desk, c. 1938. Dyer identified flea-borne typhus. In 1942, he became NIH director, supervising war-time research. With Surgeon General Thomas Parran, he wrote the 1944 Public Health Service Act which began momentum for the building of the Clinical Center. Three new institutes were opened during his tenure as director: the National Heart Institute, the National Institute of Dental Research, and the National Institute for Mental Health. He retired in 1950.

National Library of Medicine

Dr. Francis A. Arnold, Jr.'s portrait in his Public Health Service uniform, 1930s. Arnold assisted H. Trendley Dean in studying fluoride's effect on the body. In 1942, Arnold introduced the Syrian hamster as an animal model for investigating dental caries. Arnold was director of the National Institute of Dental Research, 1953-1966.

Dr. Herald R. Cox examining eggs used for growing vaccines, c. 1938. Cox found that chick embryo was an ideal growth medium for rickettsiae that cause Rocky Mountain spotted fever and typhus, leading to development of better vaccines. Working with Gordon Davis, Cox also discovered the Nine Mile strain of Q fever; the bacteria causing it was named *Coxiella burnetii* for him. Cox left government service to become head of Lederle Laboratories in New York.

National Library of Medicine

National Library of Medicine

Dr. Dorland J. Davis in his Public Health Service uniform, November 26, 1939, the year he joined the Division. During World War II, Davis investigated malaria and typhus in North Africa. He served as the director of the National Institute of Allergies and Infectious Diseases, 1964-1975. During the 1960s, Davis supervised the establishment of centers to study allergies, sexually transmitted diseases, and influenza at universities across the United States.

National Library of Medicine

Dr. Chester Emmons at his laboratory bench, 1938. Emmons was an expert on fungi as a cause of disease in humans and animals. In 1934, he established the current classification system of the taxonomy of dermatophytes. Dermatophytes are fungi that infect the hair, skin, and nails, causing the condition called ringworm. In 1948, Emmons cultured *Histoplasma capsulatum* (a mold that causes most fungal respiratory infections) from rat burrows, proving that it resides in soil. Emmons wrote the textbook *Medical Mycology*, introducing generations of students to the subject.

National Library of Medicine

Dr. Alice C. Evans experimenting with flasks of milk in her laboratory at 25th and E Streets, NW, c. 1938. Evans, the second woman scientist hired at the Hygienic Laboratory (which became the National Institute of Health), specialized in studying the bacterial contamination of milk. She identified the organism causing brucellosis, also called undulant fever, showing that the bacteria in unpasteurized milk transmits the illness to humans. She thus provided an impetus for milk pasteurization laws. Evans was the first woman president of the American Society of Bacteriologists.

National Library of Medicine

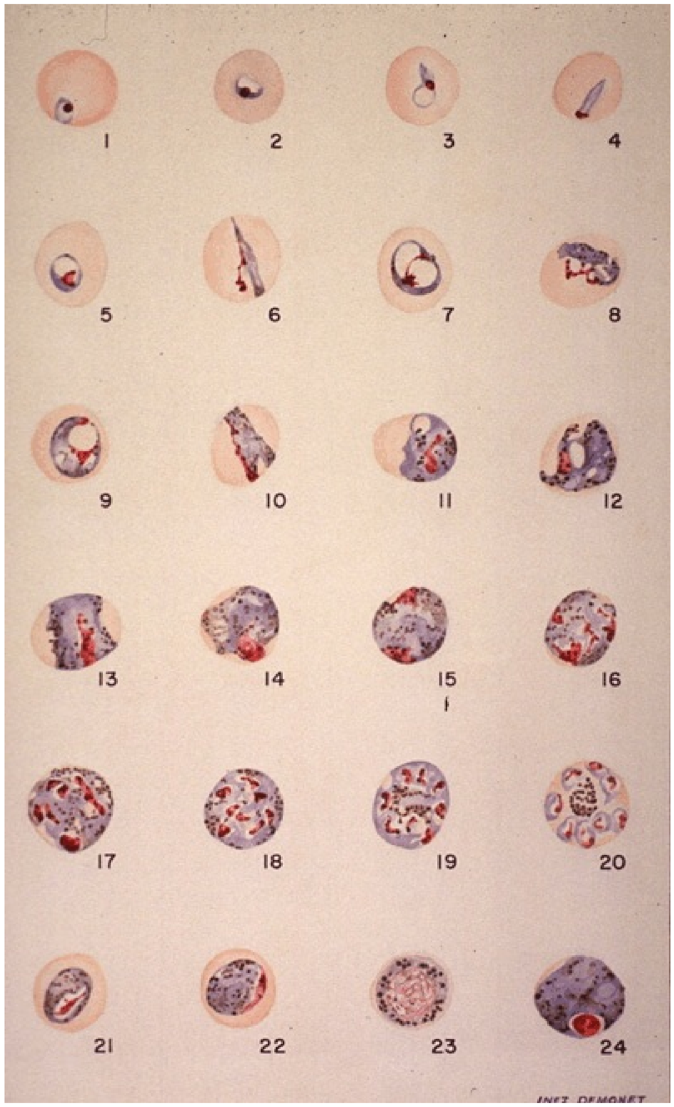
Dr. Victor H. Haas in street clothes, 1930s. Haas conducted investigations into an encephalitis epidemic in St. Louis, Missouri, in 1933. During the late 1930s, he studied bubonic plague in San Francisco. Haas served as a medical commissioner in China during World War II, supervising malaria investigations until 1948. He then became the first director of the National Microbiological Institute, a part of the National Institutes of Health, which became the National Institute of Allergy and Infectious Diseases in 1955. He retired in 1961.

National Library of Medicine

Dr. Norman H. Topping plugged test tubes with cotton while working in his laboratory at 25th and E Streets, c. 1938. Topping developed the first treatment for Rocky Mountain spotted fever and helped develop typhus vaccine. Topping was associate director of the National Institute of Health, 1948-1952, when he became vice president of medical affairs at the University of Pennsylvania. He served as president of the University of Southern California (1958-1970), and chancellor until 1980.

National Library of Medicine

A rural family enjoyed guitar music while relaxing on their front porch, 1930s. This picture, entitled "Sitting on the front porch after a hard day's work may be a dangerous form of relaxation," was a part of a public health education effort to get people to take precautions at the feeding time for mosquitoes.



National Library of Medicine

A chart depicting in microscopic detail the stages of growth of the malaria parasite *Plasmodium malariae*. This chart was illustrated by Inez Demonet, the first chief of the Medical Arts department of the National Institute of Health. Demonet created many drawings and posters used to identify different types of insects and parasites.

The Division investigated causes of infectious diseases and their effects on the heart. The original Science Service caption of 1937 read: "For examination under the microscope, [heart] tissues from the body are sliced by a microtome (right) to a thinness of 0.00024 of an inch. [Laboratory Assistant] C. F. Butler at the U.S. National Institute of Health is fixing such thinner-than-paper slices on slides to be stained with dyes and examined for minute structural changes."

National Museum of American History

Office of NIH History

Dr. H. Trendley Dean at his desk, 1930s. Dean used epidemiological studies to help pinpoint the role of fluoride in mottled enamel and prevention of tooth decay. He later became the first director of the National Institute of Dental Research.

Grand Rapids, Michigan school children spat into small bottles to give saliva samples for the water fluoridation project. Each child had a bottle cap and a tissue to wipe his/her mouth. Two women watched; one was probably the teacher and the other a public health nurse. Grand Rapids participated in Dr. H. Trendley Dean's water fluoridation study in the 1940s. Specific amounts of fluoride were added to the drinking water to see if the fluoride would cut the rate of dental caries in children.

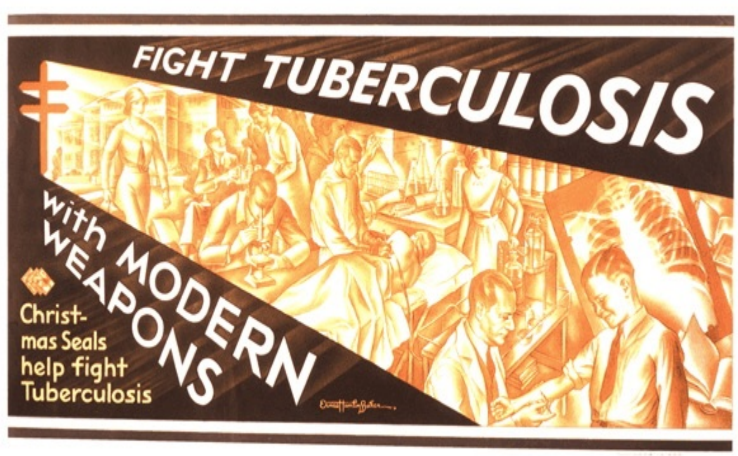
National Library of Medicine

National Library of Medicine

A public health officer took the temperatures of passengers arriving at the Miami, Florida, airport from South America, c. 1939. Any passengers suspected of having yellow fever were quarantined. Growing concern about yellow fever being spread via airplane led to Dr. Mason V. Hargett's assignment to study how to vaccinate travelers to yellow fever areas; fumigate and search planes for insects; and examine the passengers and crew for symptoms. State health workers in Texas undertook this duty after they were trained by Hargett.

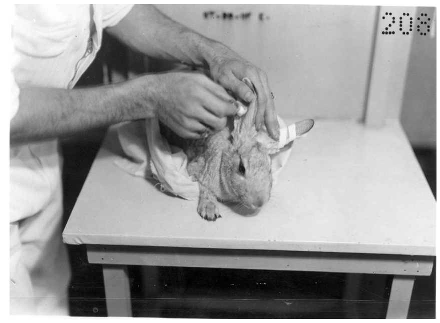
National Library of Medicine

A 1930s poster of an African-American physician beckoned the viewer to come get a chest X-ray. Such X-rays help to diagnose tuberculosis. This public health education effort of Christmas Seals reached out to minorities. For many years, Christmas Seals drives raised money for tuberculosis research as well as raising awareness of the disease. Their work benefitted the Public Health Service. Below, a Christmas Seals poster displayed the "modern" weapons against tuberculosis: medical research, surgical procedures, and diagnostic tests and X-rays, c. 1935.



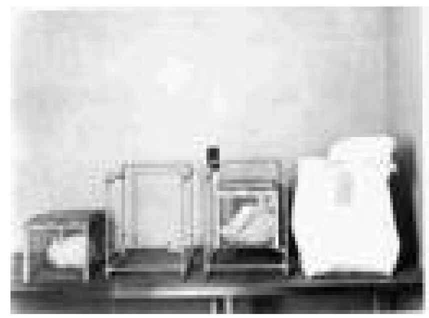
National Library of Medicine

This series of pictures, dating from the 1930s, illustrates the procedure for making Rocky Mountain spotted fever (RMSF) vaccine. The procedure was based on the life cycle of a tick: egg, larvae, nymph, and adult. A tick feeds between each of these life cycles; controlling the tick's feeding controls its development. Between feedings, a tick can survive for many months or even years. To begin the vaccine-making process, a technician placed tick larvae in rabbits' ears which were taped to keep the ticks from coming out. The rabbits were infected with RMSF. Note the technician did not wear protective gear.



Office of NIH History

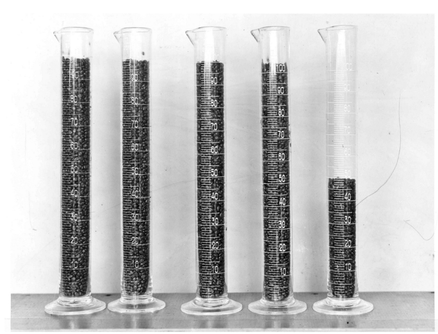
In the rabbit room, some of the rabbits had been put in bags containing tick larvae. After 24 hours, the bags were removed and the rabbits were moved to cages covered in bags. The bags were to keep the ticks from escaping. When the ticks were done feeding, they dropped off the rabbit and were recovered.


Office of NIH History

The engorged tick larvae were transferred to tubes where they would molt into tick nymphs. The tubes would be put into cold storage.


Office of NIH History

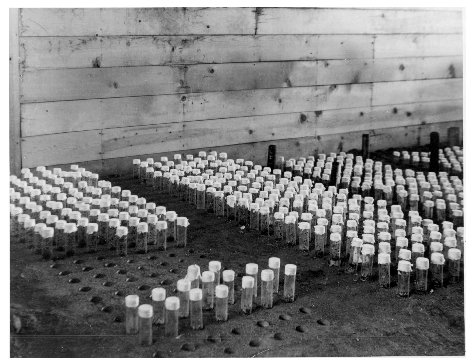
Once the tick larvae molted into nymphs, they were separated from those tick larvae that had died. These 100 milliliter flasks contained about 440 ml of tick nymphs.


Office of NIH History

After they had been fed again on rabbits infected with RMSF, the tick nymphs were separated into pill boxes and put in a low humidity incubator for several weeks until they molted into adult ticks. The top shelf of this thermal cabinet held three "tick guns." These devices held ticks while they molted. After molting, the ticks would move towards the light at the glass end, separating themselves from the moltings and dead ticks.

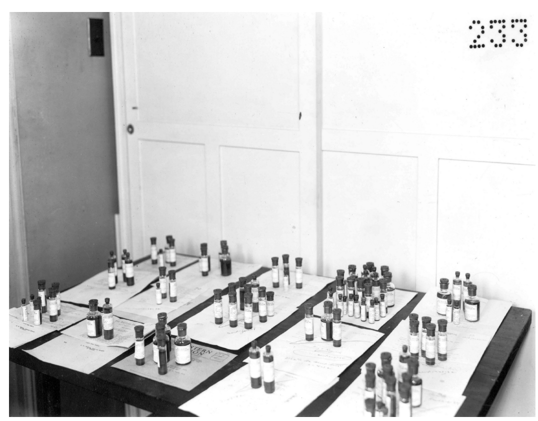
Office of NIH History

These test tubes were filled with adult ticks. The bottom of the tubes were buried in damp earth and the tops were stoppered with cotton. The adult ticks were stored for six months to a year in this manner in a refrigerated room to simulate a Montana winter.



Office of NIH History

After the adult ticks had been ground up and made into vaccine, the vaccine was bottled at the laboratory. In this photograph, bottles of RMSF vaccine awaited shipment, each sitting on a letter or telegram requesting the vaccine. Demand always outstripped supply.



Office of NIH History

Division of Pathology

National Library of Medicine

Division of Pathology chief Ralph D. Lillie solved a problem with his slide rule, 1952. His Division supported others. Lillie worked with Joseph Goldberger on pellegra preventives; Charles Armstrong on isolating benign lymphocytic choriomeningitis ("Armstrong's disease"); Maurice Smith on ginger paralysis; and Smith and Benton Westfall on selenium. Lillie conducted his own research; he is considered a founder of nutritional pathology and wrote a widely translated and used book on histopathological techniques.

Division of Pharmacology

National Library of Medicine

Dr. Carl Voegtlin in his Public Health Service uniform, 1930s. Voegtlin served as the chief of the Division of Pharmacology and the director of the National Cancer Institute (NCI) at the same time in the late 1930s. As a pharmacologist, he studied arsenical drugs, used at the time as a treatment for syphilis.

National Library of Medicine

Dr. Maurice I. Smith, 1930s. A native of Russia, Smith joined the Division of Pharmacology in 1920, where he investigated varied problems including surgical shock, selenium toxicity, and vitamins. He is best known for his role, with Elias Elvove, in determining the cause of an outbreak of Jamaican-ginger paralysis in 1931. Smith discovered the chemical cause of the outbreak: one of the esters of tricresyl phosphate in contaminated ginger extract. The extract was used to make beverages. Smith's work allowed contaminated extracts and their producers to be identified.


National Cancer Institute

Division of Pharmacology staff, 1938. Front (left to right): H. Kahler, J. Johnson, M. Smith, C. Voegtlin, W. Earle, M. Maver, and H. Bauer. Second row: T. Stark, J. Thompson, E. Emmart, M. Farrell, K. Harlow, O. Marshino, Rosen, and C. Wright. Third row: C. Doane, R. Boltz, Springstern, M. Feeser, W. Pitkerton, E. Schilling, R. Bishop, M. Goldberg, G. Jarrels and Collison. Fourth row: T. Hawkley, S. Rosenthal, R. Holbrook, R. Spencer, E. Davis, B. Westfall, F. Deeds.

Division of Public Health Methods

National Library of Medicine

Dr. Joseph W. Mountin was the director of the Division of Public Health Methods. Mountin left the NIH in 1941, becoming director of the Bureau of State Services. He developed the idea of an "Epidemic Intelligence Service," helping to found the Communicable Disease Center (now the Center for Disease Control). He also helped institute the Framingham Heart Study to see what preventive measures could be taken against chronic diseases–a study still in progress.

A Public Health Service officer, wearing a summer uniform and a plastic cap on his head, inspected a milk-carton production facility while one of the workers looked on, undated. Improperly pasteurized milk caused serious diseases. The Division's scientists help to write the Milk Codes that all producers had to follow and designed milk pasteurization equipment.

National Library of Medicine

National Library of Medicine

Water biologists from the Public Health Service Sanitary Engineering Center at Cincinnati, Ohio, used a sieve to trap organisms for sampling purposes, 1930s. The Division undertook a study of the health of the Ohio River, sampling water and fish and other aquatic life for several hundred miles along the shore.

National Library of Medicine

Dr. Mark D. Hollis inspected an insect screen on a privy in Mandan, North Dakota, 1936. In the 1930s and 1940s, many rural–and not so rural–families relied on outhouses or privies, a source of disease. The Division worked with state and local health departments to teach the sanitary construction of outhouses. Hollis later became Assistant Surgeon General.

National Library of Medicine

The Pierce County Fair parade in Rugby, North Dakota, featured several privies approved by the Public Health Service, 1936. What better way to get people excited about proper privy construction than with a parade?

Division of Zoology

National Library of Medicine

Dr. Maurice C. Hall studied a map of trichinosis cases in the United States, 1936. Hall became the first director of the Division of Zoology, transferring from the Department of Agriculture and bringing several scientists with him. They focused on parasites. Hall developed the "NIH Swab" to help diagnose pinworm infections, a method that is still used.

National Library of Medicine

Dr. Willard H. Wright at his laboratory bench at 25th and E Streets, N.W., c. 1937. Wright took over as chief of the Division after the death of Maurice C. Hall in 1938. He built up the Division in all areas, but concentrated his own research on the parasite *Entamoeba histolytica*.

Office of Cooperative Studies

Dr. James P. Leake in his Public Health Service uniform, 1930s. His office worked closely with other National Institute of Health divisions and government agencies like the Federal Drug Administration. Leake is best known for developing (with John N. Force) and popularizing the multi-jet smallpox vaccination technique and his stand against the Kolmer live-virus vaccine for polio. Leake's public rejection of Dr. John Kolmer's polio vaccine after the 1935 North Carolina epidemic spurred new versions of vaccine to be developed.

National Library of Medicine

National Cancer Institute

National Library of Medicine

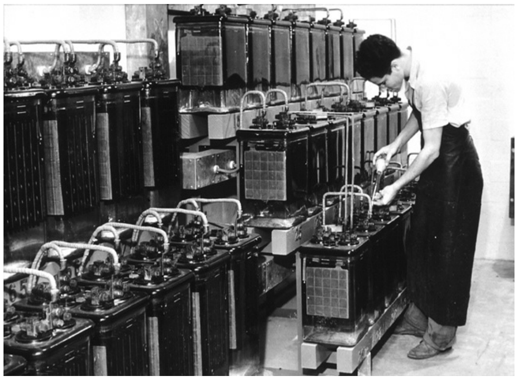
Dr. Carl Voegtlin, director of the Division of Pharmacology at the National Institute of Health and director of the National Cancer Institute at his roll top desk, 1937.

National Cancer Institute

Staff of the Public Health Service's Office of Cancer Investigations, located at Harvard University, before moving to the National Cancer Institute's Building 6 in October 1939. Front row (left to right): J. Trovato, D. Howard, Rose Robin (Rose Miner), Theresa Shovelton, Roger O'Gara, D. Silverman, Francis Linnell, Joseph Stasio, and Floyd C. Turner (medical director). Center row (left to right): Murray J. Shear, Harold L. Stewart, H. Grady, Howard B. Andervont, Egon Lorenz, Joseph Leiter, and Adrian Perrault. Back row (left to right): F. Kennedy, William McEleney, Jonathan L. Hartwell, Michael Shimkin, John J. Murphy, Walter Gately, and Henry L. Meyer.

National Library of Medicine

Staff of the Public Health Service Office of Field Investigation of Cancer before becoming part of the National Cancer Institute, 1937. From left to right: Floyd C. Turner, medical director, Joseph Stasio, Joseph Leiter, Jonathan L. Hartwell, Walter Gately, Adrian Perrault, Henry L. Meyer, Francis Linnell, John J. Murphy, Rose Robin (Rose Miner), Roger O'Gara, William McEleney, Theresa Shovelton, Howard B. Andervont, Catherine V. Porter, Murray J. Shear, Harold L. Stewart, Thomas White, and Egon Lorenz.



National Cancer Institute

Douglas Howard inspected the large batteries for machines used by the Pathology Division of the National Cancer Institute, November 1939.

National Cancer Institute director Carl Voegtlin and Dr. Murray J. Shear the reviewed the publication entitled "Mobilizing Man, Mice, and Machines for the Fight," 1940. The pamphlet was part of the Institute's public education outreach. Shear discovered that certain substances enable other factors to cause cancer, coining the term "co-carcinogens" to describe them. He also pioneered chemotherapy for cancer.

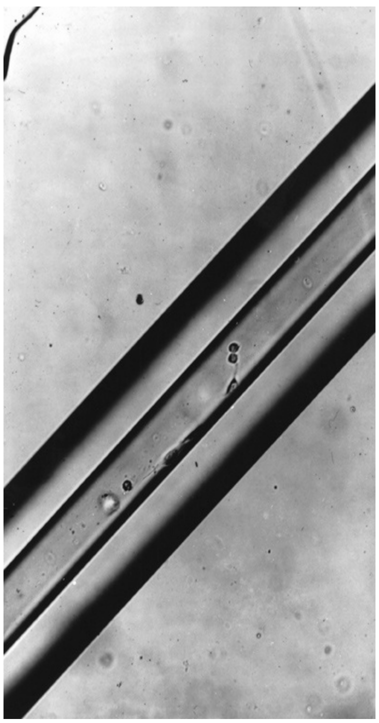
National Cancer Institute

National Cancer Institute

A male technician prepared to take an X-ray of a female patient, 1940. The photograph was used in an Institute public education campaign called "Once a Year for a Lifetime." The campaign stressed getting a yearly chest X-ray to check for tuberculosis. This picture was supposed to dispel fears about the X-ray procedure–a procedure that most people in the 1930s and 1940s had not experienced.

Row upon row of rubber-stoppered carrel flasks used for tissue culture growth, 1940s.

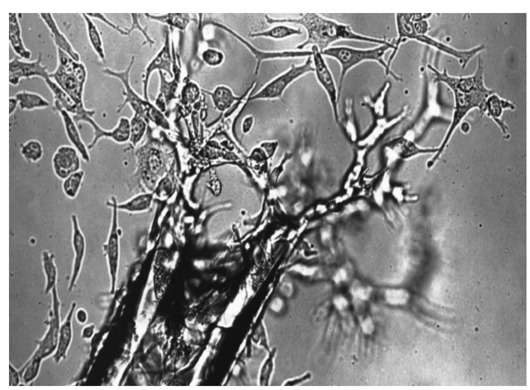
National Library of Medicine



National Cancer Institute

A single cell isolated in a capillary pipette to grow in a tissue culture in the laboratory of Dr. Wilton Earle, 1943. Earle pioneered the method of growing cells in a culture without an animal host, providing an easier way to study cancer cells. For more about Earle, see "A Closer Look: Scientific Instruments of the 1930s."

Photomicrograph of multiple cells grown in a tissue culture in the laboratory of Dr. Wilton R. Earle at the National Cancer Institute, 1943.



National Cancer Institute

A Closer Look: Scientific Instruments of the 1930s

Dr. Rolla E. Dyer, director of the Division of Infectious Diseases, 1936-1942, once told an interviewer: "It should be recalled that this was before the development of modern laboratory equipment of the present. A pathologist needed a microscope and a hand-operated microtome, staining equipment, a work bench and a stool. In experimental work, a biologist needed some syringes, scissors, animals, centrifuges and autoclaves were also provided."
(Rolla E. Dyer interview in the George Rosen Collection of Oral History Transcripts, History of Medicine Division, National Library of Medicine, MS C 203)

Despite Dyer's exaggerated claim for the simplicity of research technology in the 1930s, the scientists at the National Institute of Health (NIH) had a variety of tools to aid them in their investigations. The NIH Stetten Museum (part of the Office of NIH History) has many such instruments in its collection, most actually used at the NIH. Here are some of the scientific instruments from the 1930s in the Museum's collection.

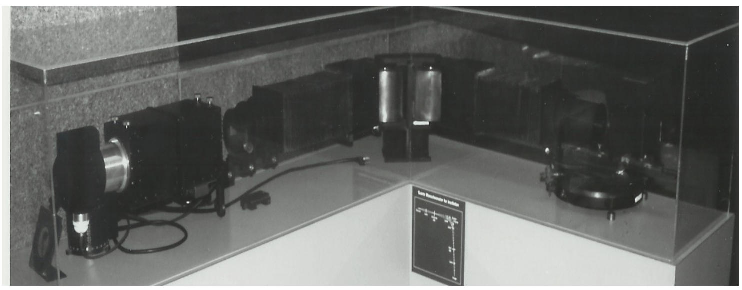
Measuring Devices

Office of NIH History

Cambridge Instrument Co. Electrocardiograph String
June 1937
90.0005.011.00
Donated by Dr. Robert Bowman, National Heart, Lung, and Blood Institute

In the late 1930s, the National Institute of Health's Division of Public Health Methods used this instrument to record children's electrocardiograms. The Division sought to relate variations in cardiac function as shown on the electrocardiograms to specific heart conditions and diseases in children. The scientists also evaluated the use of electrocardiograms in school health services as a diagnostic tool.

Willem Einthoven (1860-1927) developed the electrocardiogram using a string galvanometer (for this work, he won the Nobel Prize in Physiology or Medicine in 1924). A galvanometer amplified electrical signals. In a string galvanometer, a microscopic "string" of silvered quartz was suspended vertically in a magnetic field. When a beam of light was deflected by an electrical impulse from the heart, the light moved the string slightly. In this manner, the functioning of the heart could be electrically recorded. Working with Einthoven, the Cambridge Instrument Company began producing the string galvanometer electrocardiogram in 1903, but its design and function were still being improved in the late 1930s. After World War II, direct recording electrocardiograms came into use instead of string galvanometers.



Office of NIH History

Brackett Spectrometer
1938-1939
89.0001.212.00
Donated by Dr. Robert Bowman, National Heart, Lung, and Blood Institute

Dr. Frederick S. Brackett (1896 -1988) was a pioneer in the field of spectroscopy and a scientist in the National Institute of Health's (NIH) Division of Industrial Hygiene. He developed this spectrometer in the late 1930s with J. B. Horner Kuper and Maynard Eicher, and the Washington Biophysical Institute (which became part of the National Institute of Diabetes and Digestive and Kidney Diseases).

Two of the largest natural quartz prisms in the world are in this instrument, supplied by Bausch and Lomb to Brackett's design. This spectrometer used the two prisms to spread wavelengths of light over a large distance in space so that it was easy to pick out a single wavelength or a very narrow band of wave-lengths. This wavelength or narrow band of wavelengths of light were then used to illuminate a sample.

The Division of Industrial Hygiene developed and applied spectrographic methods to measure toxic chemicals in body fluids. "Clinical examinations in the field are sometimes unable to detect sub-pathological conditions. This places the responsibility for such detection upon the laboratory, and emphasizes the demand for methods of analysis that are capable of estimating quantitatively, very minute amounts of material." ["Spectroscopic Analysis of Biological Fluids for Heavy Metals," D.W. Armstrong and F.S. Brackett, *Journal of Industrial Hygiene and Toxicology*, Vol. 21, No. 9, November 1939, page 448]

As a graduate student at Johns Hopkins University in 1922, Brackett discovered a series of hydrogen lines, now called the "Brackett Series," in the infrared spectrum from the hot gases of the sun. Brackett received the Legion of Merit for his work during World War II developing special safety equipment for combat vehicles. After the war, he directed the NIH's photo-biology section and introduced the use of computer technology to interface with other instruments. He also made contributions to quantum theory. In 1974, the International Astronomical Union honored Brackett by naming a moon crater after him–at the time he was the only living person so honored.

Office of NIH History

Fric Half Shade Polariscope with Variable Brightness, No. 1502
1907
89.0001.300.00
Donated by Dr. Cornelius Glaudemans, National Institute of Diabetes and Digestive and Kidney Diseases

This polarimeter was used for many years in the National Institute of Health's Division of Chemistry, established by Dr. Claude S. Hudson, a leading carbohydrate chemist. It was manufactured by Josef and Jan Fric in Czechoslovakia in 1907, and was the official United States Bureau of Standards indicator for sugar content. The polariscope most likely belonged to Hudson personally.

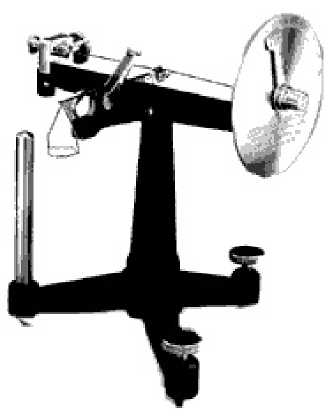
The polarimeter measured the optical rotation of light in a sample to help identify what was in the sample. In 1860, Louis Pasteur discovered that optical rotation was a property of molecules that could be used to identify them. Since that time optical rotation measurements have been used in many ways, from measuring the concentration or purity of sugar to complex research on the molecular structure of proteins and DNA. During the 1930s, the NIH's Division of Chemistry performed many investigations into rare sugars.

To take a measurement, a sample was placed in a tube in the polarimeter, which was illuminated at one end. The indexed disc at the eye piece was rotated until the person looking in the eyepiece saw the halves of the field illuminated identically. The reading on the disc (in degrees) was the optical rotation of the material in the sample. Modern devices do not require visual examination by the researcher.

Office of NIH History

Illinois Testing Labs Alnor Velometer, Type 3002
1939
89.0001.156.00
Donor unknown

In the 1930s, the Illinois Testing Labs began manufacturing the velometer, which was used for indoor air measurement. Velometers could measure air velocity in fume hoods and heating and ventilation systems, as well as fan and blower performance. They also could monitor sprays and take static pressure measurements. This instrument was most likely used in the National Institute of Health's (NIH) Division of Industrial Hygiene, which was concerned with measuring air quality for factory workers. It may also have been used to test the state-of-the-art ventilation system in the new NIH buildings in Bethesda.



Office of NIH History

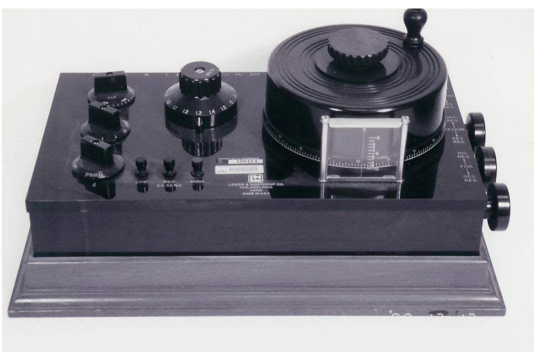
Central Scientific Co. (CENCO) du Nouy Precision Direct Reading Model Tensiometer
Late 1930s-early 1940s
95.0011.001.00
Donated by Dr. Robert Bowman, National Heart, Lung, and Blood Institute

The tensiometer was invented by Pierre Lecomte du Nouy (1883-1947) at the Rockefeller Institute to measure the surface tension of liquids. This CENCO tensiometer took a reading directly from the surface of the sample liquid and was extremely accurate. A platinum ring was attached to a wire which exerted force on the ring when the sample was raised to meet the wire. The amount of force was shown on the graduated dial. This method allowed repeated readings that only took 15 to 30 seconds to complete. Only a small of amount of the sample liquid was required, an important consideration in the study of biological fluids.

Office of NIH History

Klett Manufacturing Company, Inc.
Summerson Photoelectric Colorimeter
1939-1940
89.0001.299.00
Unknown donor

National Institute of Health (NIH) scientists could determine the concentration of a substance in a solution with a colorimeter. The colorimeter measured the intensity of the color produced by the substance, which was related to the substance's concentration in the solution, and compared it to a standard. Many NIH laboratories of the 1930s-1940s used colorimeters such as this one, especially for measuring hemoglobin levels in blood or determining a sample's pH level.



Office of NIH History

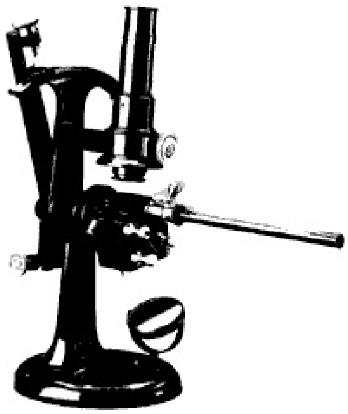
Leeds & Northrup Slide Wire
Potentiometer, Model K-2
c. 1938
89.0001.204.00
Donated by Dr. Robert Bowman, National Heart, Lung, and Blood Institute

The slide-wire potentiometer was invented by Johann Christian Poggendorff in 1841, and became a common laboratory instrument in the first half of the 20th century. Scientists used potentiometers to determine pH levels in samples by measuring electrical voltage. Potentiometers were a more accurate way to determine pH than colorimeters because it did not matter if the sample was cloudy and did not depend on a human's judgment of color for the result. This model had three voltage ranges and could measure voltages to the 0.000002 volt, a very sensitive reading.

Office of NIH History

Van Slyke Manometric Apparatus
c. 1941
89.0001.249.00
Donated by Dr. Rollin D. Hotchkiss, Rockefeller University

Dr. Donald Van Slyke (1883-1971) designed this instrument to measure the components of biological fluids by extracting the components in the form of a gas. The instrument had a major impact on both laboratory and clinical chemistry. Between 1920 and 1960, scientists employed the Van Slyke apparatus for many and varied uses, including to research the components of blood, to study blood's acid/base balance, and to diagnose diabetes and kidney disease. This particular instrument was made for Dr. Rolling D. Hotchkiss at the Rockefeller University by Van Slyke's machinist John Plazin, but it is representative of the many Van Slyke instruments found in laboratories at the National Institute of Health from the 1930s to the 1960s. To see this instrument in person, visit the exhibit in the Natcher Building on the NIH campus.

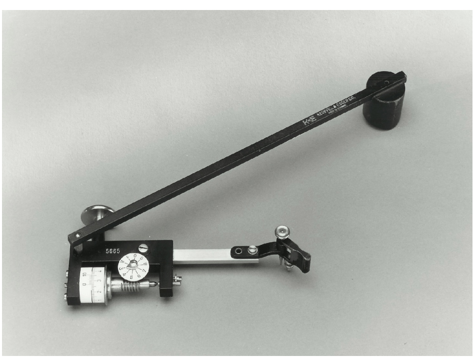


Bausch & Lomb Optical Co. Abbe Refractometer
Between 1926-1941
91.0008.015.00
Donated by Dr. DeWitt Stetten, Jr., National Institutes of Health

Office of NIH History

The refractometer is another instrument used to determine concentrations and identify substances, such as the amount and kind of protein in blood or urine. The inventor of the Abbe refractometer, Ernst Abbe (1840-1905), became the owner of the Carl Zeiss Company in Germany, a manufacturer of precision optical instruments. This refractometer was an imitation of the Zeiss model of Abbe's instrument.

The index of refraction is a property of all transparent substances. It is measured by determining the angle at which a beam of light is bent, or refracted, as it passes through a substance. In this refractometer, a drop of liquid was placed between two halves of a split prism. The prism was maintained at any desired temperature by the circulation of water through the system from a constant temperature source. The prism assembly was manually rotated under the fixed inspecting telescope. The refractive index was read through the eyepiece over the scale.



Keuffel & Esser Co. Planimeter
c. 1930
89.0001.141.00
Unknown donor

Office of NIH History

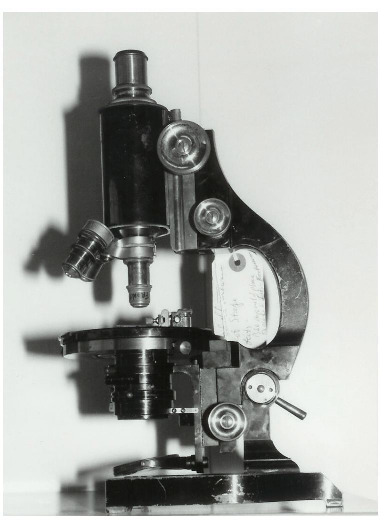
Engineers and cartographers normally used a planimeter to find the area of an irregular shape, such as a city or a lake drawn on a map. Medical researchers also used this small instrument to measure biologic phenomena. Jakob Arnsler, professor of mathematics at the University of Schaffenhausen in Switzerland developed the planimeter in 1854. It consists of two arms: one affixed to the page using a pin, the other containing a stylus used to trace around the unknown area. As the region is traced, a small wheel rotates against the paper, recording the area on a dial.

Microscopes

Office of NIH History

Carl Zeiss Inc. Monocular Microscope
1920s-1930s
96.0003.002.00
Donated by Dr. Umberto Saffiotti, National Cancer Institute

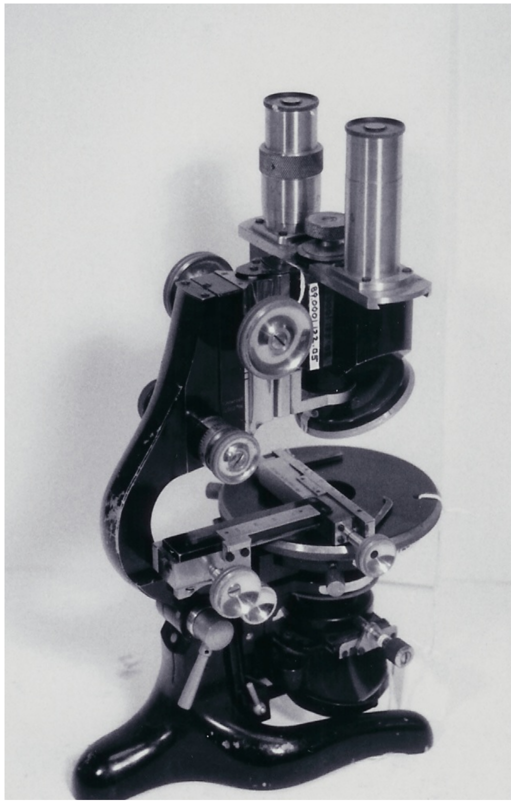
Dr. Harold "Red" Stewart of the National Cancer Institute (NCI) used this microscope for his entire career at the Laboratory of Pathology, 1939-1969 (he was its first chief). It was through this microscope that Stewart saw lesions in sections of experimental animals that led him to study the effect of chemical carcinogens in rodents. Along with his colleague Dr. Thelma Dunn, Stewart pioneered methods to induce cancer of the stomach and intestines in experimental animals. His research became the first animal tumor model system for the study of gastric cancer in humans and helped to lay the foundation for the development of the field of experimental carcinogenesis. He retired from the NIH in 1969.



Office of NIH History

Ernst Leitz Inc. Monocular Microscope
1920s
90.0001.001.00
Donated by Dr. Robert Bowman, National Heart, Lung, and Blood Institute

This microscope belonged to Dr. Thomas H. D. Griffitts who specialized in epidemiology and malaria. He conducted field investigations on malaria and its prevention from 1915 to 1934, and even volunteered for inoculation with malaria in New Orleans in 1914-15. Griffitts also wrote several articles on mosquitoes and their breeding habits. Malaria was one of the diseases on which the National Institute of Health concentrated, with scientists studying the different species of mosquitoes that carried the disease, how the disease was transmitted to and progressed in humans, and how to control mosquitoes through sanitary and biological measures. This microscope was sent to him to do work in Georgia.

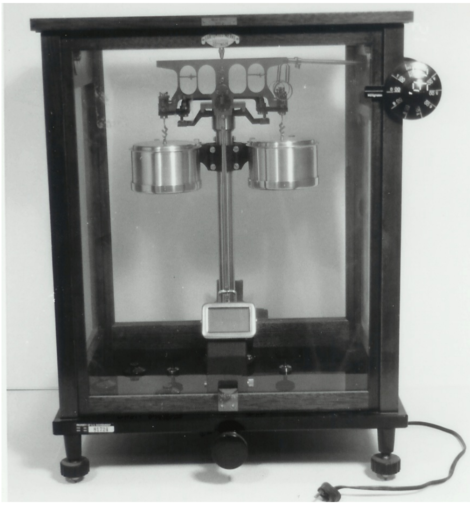


Office of NIH History

Ernst Leitz Inc. Dark Field Microscope
June 1930
89.0001.122.00
Donated by Dr. Freddy Homberger, Cambridge, Massachusetts

This Leitz microscope was a type that was heavily used at the National Institute of Health (NIH) in the 1930s and 1940s. A dark field microscope did not shine light through a specimen on the slide; an opaque disk diffused the light so that particles in the specimen reflected the light. Cells such as bacteria could be especially well seen and studied–an important contribution in the growing field of bacteriology in the 1930s.

Balances



Sartorius-Werke Precision Microbalance, Model DP2
1932
89.0001.100.00
Unknown donor

Office of NIH History

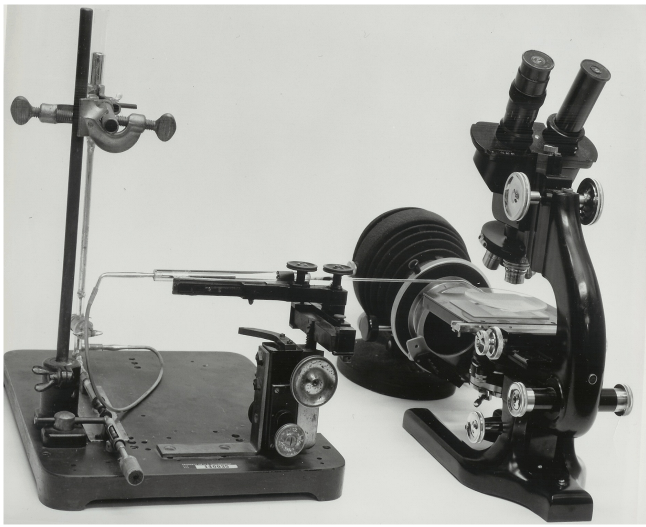
Analytical balances were a basic tool for most laboratories at NIH in the 1930s. This balance was an equal-arm model: the weighing operation was performed by balancing a sample placed on one pan with reference weights placed on the other pan. The balance could detect a small difference in mass and had a maximum load of 200 grams. To avoid handling extremely small reference weights, the balance was equipped with an adjustable chain or a rider mass (a weight on the arm) that could be moved to make small changes.

Henry Troemner Analytical Balance, No. 35
c. 1925
89.0001.097.00
Donated by James Wyngaarden, Director, National Institutes of Health

Office of NIH History

This balance was made by Henry Troemner for the Arthur H. Thomas Co. It has a mahogany case, a brass central pillar, aluminum beam, agate knife edges, ivory pointer scale, and polished silver pans. Despite its elegant appearance, it was an inexpensive balance popular in educational and scientific laboratories. It had a capacity of 200 mg and an accuracy of 1/5 of a milligram. The brass balance weights came in a handy wooden case with an ivory tipped stainless steel forceps for moving them onto and off the balance pan.

Micromanipulators

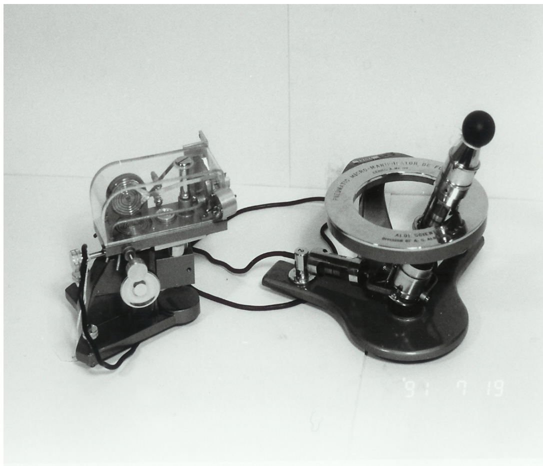


Rees Micromanipulator
c. 1939
89.0001.146.00
Donated by Dr. Louis Diamond, National Institute of Allergy and Infectious Diseases

Office of NIH History

Micromanipulators allow the direct manipulation of single cells by translating hand movements into extremely fine movements of small instruments. This micromanipulator was developed by Dr. Charles W. Rees of the Division of Infectious Diseases in 1939, to isolate single *Entamoeba histolytica* bacteria to study. *Entamoeba histolytica* lives in the intestinal tract of humans but can become deadly when it is invasive, causing diarrhea and dysentery. Because Rees' micromanipulator could isolate a single cell at a time, a scientist could start a pure cell line in tissue culture.   Rees and his technician I. Louise Bartgis never succeeded in making a pure antigen for *Entamoeba histolytica* because a suitable culture media had not been developed for it grow on. However, many National Institute of Health scientists used this instrument for other work including Drs. Louis Diamond, Leon Jacobs, and Marge Melton.

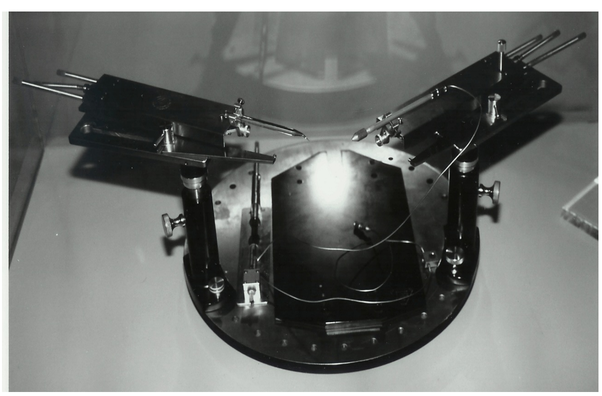
In August 1940, the Science Service (a news wire service) described Rees' micromanipulator as a weapon to against the parasite causing amebiasis: "The fine glass pipette which snares or sucks them [the parasites] one at a time out of the jungle under the microscope is seen....Amoebae are discharged from it into the test tube held in the scientists's right hand. They are washed free of bacteria and other debris and used in the attempt to develop material for a skin test for amebiasis."



A.S. Aloe Co. Pneumatic Micro-manipulator de Fonbrune, Series A, No. 119
c. 1942
89.0001.151.00
Donated by Dr. Robert Bowman, National Heart, Lung, and Blood Institute

Office of NIH History

At about the same time that Dr. Charles Rees of the Division of Infectious Diseases developed his micromanipulator, instruments designed by Pierre de Fonbrune were coming onto the American market. De Fonbrune's micromanipulator used a pneumatic actuator to move the tip instead of a mechanical or hydraulic system which could cause backlash. The hand control knob was connected to a piston system which drove air into the actuator and translated the gross movements of the joystick into fine adjustments of the tip. "With a single control lever, micro-needles, micro-scalpels and other micro-instruments are manipulated in all planes. The investigator using this equipment is free to give his full attention to the problem without distraction or blind fumbling" (Aloe Scientific, *Bulletin T114*, "de Fonbrune Micro-manipulator and Micro-Forge," c. 1939). This manipulator could be used to isolate and/or investigate the inside of single cells.

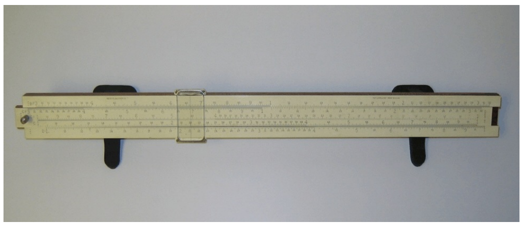


Bausch & Lomb Optical Co. Micromanipulator
c. 1933
89.0001.147.00
Unknown donor

Office of NIH History

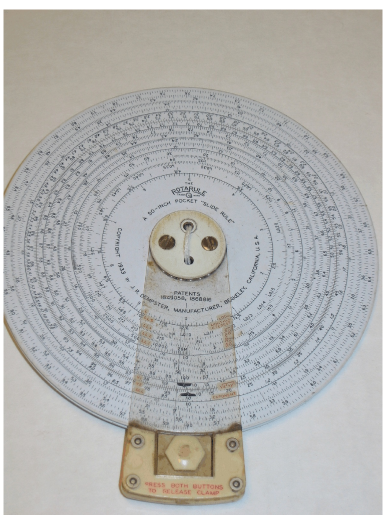
This micromanipulator, of George W. Fitz's design, was granted a patent in May 1932. Part of the description Fitz submitted to the Patent Office describing his micromanipulator said, "Still another object is to provide a pair of micro-manipulator units adapted for use, respectively, on the right and left hand sides of a microscope." Using this micromanipulator, right or left-handed investigators at the National Institute of Health could inject fluids and insert microelectrodes into and operate on a cell while looking at it through a microscope. This instrument was used at the National Heart, Lung, and Blood Institute.

Slide Rules


Office of NIH History

Keuffel & Esser Desk Slide Rule, N-4096
c. 1940
95.0006.003.00
Donated by Dr. Robert Berger, National Heart, Lung, and Blood Institute

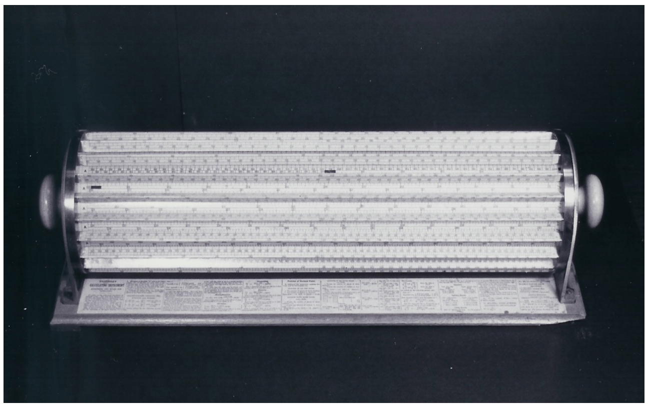
Before calculators, slide rules helped people perform complicated mathematics quickly and accurately. The first K&E desk slide rule (as opposed to a pocket or hand slide rule) was offered for sale in 1928. This version, however, had an improved indicator which included DF, CF, CI, C, and D scales. The K&E Catalogue (38th Edition, 1936, page 323) described this desk slide rule as being "especially designed for the Merchant, Importer, Exporter, Accountant, Manager, Mechanic, Foreman, and others, whose computations involve only multiplication, division, proportion, and percentage." The cursor was a magnifying glass and the slide was on a stand with a knob for one-handed use.


Office of NIH History

J. R. Dempster RotaRule Pocket Slide Rule, No. AA
c. 1945
01.0010.001.00
Donated by Dr. Janet R. Hartley, National Institute of Allergy and Infectious Diseases

The RotaRule circular slide rule was patented in 1932 by J.R. Dempster. His patent application asserted that he had designed a circular slide rule of improved operation. The outer ring revolves around inner ring; from the center a runner can revolve around both rings. The rings were marked so that by using one or both rings, a person could perform many mathematical calculations.

Slide rules were basic tools for scientists–who each may have owned many slide rules–until the advent of the calculator in the 1970s. This slide rule was used for many years by Dr. Wallace P. Rowe (1926-1983) of the National Institute of Allergy and Infectious Diseases to make rapid calculations for data analysis--before and even after hand calculators were readily available. Rowe was the first to isolate an adenovirus in patients and helped to clarify their role in respiratory diseases. He also described the epidemiology and clinical characteristics of these viruses.



Office of NIH History

Keuffel & Esser Co. Thacher's Calculating Instrument, No. 4012
c. 1927
89.0001.011.00
Donated by Dr. Makio Murayama, National Institute of Arthritis and Metabolic Diseases

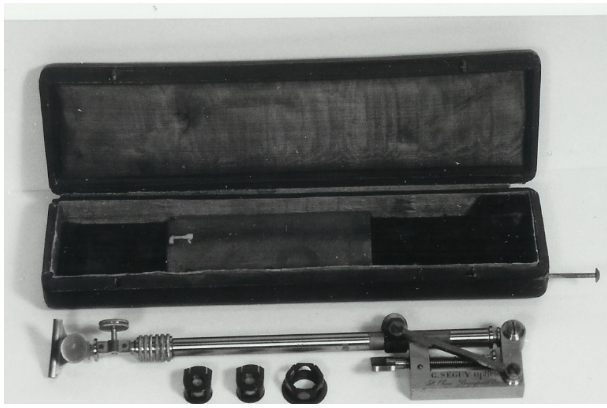
Patented by Edwin Thacher in 1881, this cylindrical slide rule with twenty triangular bars was uncommonly accurate. The accuracy of a slide rule depends on how long it is, because the divisions on the scales can be more precise the longer the rule. Thacher's cylindrical rule rotated as well as sliding in and out and had two logarithmic scales. The total length of the scales was about 40 times longer than the instrument, giving precision up to four digits or .01 of 1%.

Other Necessities

Office of NIH History

Royal Co. "Touch Control" Manual Typewriter
1930s-1940s
89.0001.006.00
Donor unknown

This model of typewriter was introduced by the Royal Company in 1936. It offered "Touch Control," a feature that allowed typists to adapt the key-tension to their own finger pressure. This typewriter was used by a secretary at the National Institute of Health.



Office of NIH History

G. Seguy Camera Lucida
Early 20th century
89.0001.139.00
Donated by Dr. John Buck, National Institute of Diabetes and Digestive and Kidney Diseases

This exquisite device, a product of "G. Seguy, Opticien, 58 Rue Bonaparte, Paris," was used in the National Institute of Health's Division of Industrial Hygiene to draw microscopic objects such as cells.

The camera lucida had been used as a drawing aid long before Seguy made this one. The original version had a small glass prism held in a fixed position by an adjustable support over the drawing surface. The user looked downward into the prism, seeing the reflection of the subject. Because of the prism's shape and orientation, the subject was reflected twice within the prism before reaching the eye, making the view seen by the eye the right way up.

The original camera lucida had a significant disadvantage: the user's eye had to be positioned so that the two views (the subject and the paper) could be seen through different parts of one eye. The eye had to be precisely positioned and kept very still.

In this camera lucida, the problem of trying to view two scenes through a single eye were eliminated by using a semi-transparent mirror to create one of the two reflections required. In such a mirror, the viewer could see both the actual subject and the reflected subject on the drawing paper. Two prisms gave the user a choice of eye location. Pivoted filters smoothed the illumination of the subject and drawing paper and extra rectangular lenses provided distance correction.

Claude S. Hudson Collection

Dr. Claude S. Hudson (1881-1952), was the chief of the Division of Chemistry at the National Institute of Health (NIH), 1928-1952. Hudson helped found the field of carbohydrate chemistry, formulating "Hudson's Rules" about the optical rotation of sugars. Born in Atlanta, Georgia, Hudson originally intended to be a minister, but decided that chemistry was his calling. He graduated from Princeton in 1901, then stayed to receive his Master's (1902) and Ph.D. (1907). During his Princeton days, he studied for a year in Germany under Walther Nernst and Jacobus H. van't Hoff, two Nobel-prize winning chemists. In 1908, Hudson joined the Department of Agriculture's Bureau of Chemistry, performing urine analyses to test food preservatives. Hudson joined the "poison squad" studies of World War I, discovering how to activate charcoal to absorb poisonous gas. Leaving government work after the war, Hudson became a consulting chemist, receiving patents for activated charcoal, confectionary glaze, and isopropyl alcohol.

In 1923, Hudson rejoined government service at the National Bureau of Standards before coming to the National Institute of Health (NIH) in 1928. Hudson possessed a lively personality and was known for concentrated work in the laboratory and mentoring younger scientists. Below are just a few of the objects in the Museum's collection of Hudson instruments. For photographs of the Division of Chemistry, visit the photograph section of this chapter.

Office of NIH History

Proof and Tralles Scale Hydrometer (Manometer)
c. 1920
01.0002.011.00
Donated by Dr. Cyrus R. Creveling, National Institute of Diabetes and Digestive and Kidney Diseases

A hydrometer measured the specific gravity of a liquid. The glass tube was sealed at both ends, the bulb end holding either lead shot (like this one) or mercury to make the hydrometer float upright in a sample liquid. By reading where the liquid's surface hit the scale inside the tube, a researcher could measure how many times heavier or lighter the sample liquid was than water. This measurement was its specific gravity. The level the hydrometer floated at depended on the density of the liquid, so that measurement could also be made. This hydrometer was used to determine the purity and proof of alcohol. The Proof scale showed the proof of alcohol from 0-200 at 60º F. The Tralle scale showed the percentage of ethyl alcohol by weight in the sample. For example, if the hydrometer sank to 0, the sample was pure water; if it sank to 100, the sample was pure ethanol.

Brix Scale for Sugar Hydrometer (Manometer)
c. 1920
01.0002.012
Donated by Dr. Cyrus R. Creveling, National Institute of Diabetes and Digestive and Kidney Diseases

Office of NIH History

This hydrometer worked much like the Proof and Tralle hydrometer except that it measured the sugar content of a sample solution, not the alcohol content, and used mercury instead of lead shot. Each degree on the Brix scale equals one percent of sugar in the solution. The scale can also be used to measure the concentration of all the soluble solids in a solution (proteins, sugar, acids, etc.), but this takes a conversion chart.

Saxe's Urino Pycnometers
c. 1920
01.0002.014-015.00
Donated by Dr. Cyrus R. Creveling, National Institute of Diabetes and Digestive and Kidney Diseases

Office of NIH History

The pycnometer was used to measure the specific gravity or density of urine. This instrument included the instructions: "The Urino-Pycnometer must be filled with the liquid up to the 3 ½ cc graduation mark accurately; then should be carefully closed and finally weighed under maintenance of the temperature." Such measurements could be used to determine what solids were present in a urine sample, aiding chemical investigations or clinical diagnosis.

H. Trendley Dean Dental Instrument Collection

Born in East St. Louis, H. Trendley Dean (1893-1962) graduated from the St. Louis University School of Dentistry in 1916. He soon was called to support the United States Army in France for the remainder of World War I. Dean then returned to private practice but joined the Public Health Service in 1921. For the next ten years, Dean worked in several Marine Service hospitals (run by the Public Health Service) performing dental examinations, surgery, and research.

Dean became the only dentist assigned to the National Institute of Health (NIH) in 1931. He is best known for his interdisciplinary studies of the relationship between fluoride and dental caries. This research resulted in the addition of fluoride to municipal water supplies to fight tooth decay. But Dean conducted research into other dental diseases, studying radiation's effects on the jaw bone and seeking how to prevent and cure Vincent's angina (trench mouth–an infection causing ulcers on the gums, loss of mouth and throat tissues, and swelling of the throat).

Dean's most important accomplishment was making dental disease a recognized component of general medical research. In 1931, Dean was the only dentist at the NIH; sixteen years later, he became the first director of a whole institute devoted to dental research. Dean retired as director of the National Institute of Dental Research in 1953. Here are only some of Dean's instruments in the NIH Stetten Museum's collection.


Office of NIH History

Cleveland Dental Mfg. Co. Dental Hand Instruments
Early 20th century
02.0019.060.00
Donated by Brent Jaquet, National Institute of Dental and Craniofacial Research and the Dean Family

These instruments are part of "Dr. G.V. Black's Cutting Instrument Set of 102." Greene Vardiman Black began practicing dentistry in 1856, after studying medicine under his brother for four years, working with a dentist for a few months, and reading a dental book. Black's goal was to professionalize dentistry by establishing standard procedures using standardized tools like these. Dental students still learn how to use Black's instruments. The tools are numbered: "14-6-6" is a cutting edge fourteen-tenths of a millimeter wide, on a blade six millimeters long, set at an angle of six centrigrades. A final number, from 1-102, identifies the instrument's place in the set. Dean had Black's instruments from several dental companies, but never a complete set of 102. Black and Dean's professional lives crossed: Black began the initial investigation of mottled teeth in Colorado–an investigation that Dean finished.

S.S. White Dental Mfg. Co. Dental Dam Kit
Early 20th century
02.0019.045.00
Donated by Brent Jaquet, National Institute of Dental and Craniofacial Research and the Dean Family

Office of NIH History

Dental dams did many things: they isolated the tooth or teeth being worked on; protected the patient's soft tissue from dental instruments; kept debris and solutions out of the mouth; and helped patients keep their mouths open. The Ainsworth punch put holes in the dental dam sheet (now usually made of latex), while the forceps were used to put the clamps around a tooth. The clamps held the dam sheet down around the tooth. Some clamps had wings and some were used only on particular teeth. A metal frame secured the sheet tightly over the entire mouth. This particular kit was patented in 1888, but dentists still use dental dam sets exactly like this one.

S.S. White Dental Mfg. Co. Impression Trays
Early 20th century
02.0019.038.00
Donated by Brent Jaquet, National Institute of Dental and Craniofacial Research and the Dean Family

Office of NIH History

Impression trays were filled with plaster, wax, or other molding compound to make a mold of a patient's teeth and palate. The molds were used to make dental appliances such as dentures and bridges. Trays came in different sizes depending on the patient's age and mouth size. The u-shaped trays were used for the lower teeth; the full-arch trays were for the upper teeth and palate. Some of today's impression trays are clear or brightly colored plastic designed for a single use.

Office of NIH History

Dentists' Supply Co. of New York Trubyte Crown Kit
Early 20th century
02.0019.005.00
Donated by Brent Jaquet, National Institute of Dental and Craniofacial Research and the Dean Family

In an era when dental disease was rampant, teeth often had to be replaced or covered by crowns. This kit was used to match the crown as close as possible to the original tooth for a natural look. The porcelain teeth were labeled to show where in the mouth they would fit–as laterals, special laterals, centrals, or canines–and individually numbered. The trademark is still used.

Office of NIH History

Cleveland Dental Mfg. Co. Burner and Dr. W.G. Crandall's Alloy Balance, Fellowship Alloy, and Crucible
Early 20th century
02.019.008, 044, 033, and 022
Donated by Brent Jaquet, National Institute of Dental and Craniofacial Research and the Dean Family

These are some of Dr. H. Trendley Dean's tools for making dental fillings. Friendship Alloy was one type of material used to make fillings; dentists at the time were experimenting with several materials. The alloy would be measured in the pan of the balance against the sliding weight on the other side, placed in the crucible, and melted over the burner.

Office of NIH History

Buffalo Dental Mfg. (BDM) Co. Plugger, Roach Trays, and S.S. White Dental Mfg. Co. Plugger
Early 20th century
02.0019.034, 041, and 042
Donated by Brent Jaquet, National Institute of Dental and Craniofacial Research and the Dean Family

Here are more of Dean's tools for filling teeth. Sometimes he used a small tray (called a roach tray) and modeling compound to take impressions of cavities. A gold foil hammer (not shown here) was used on thin sheets of gold or silver to create fillings or crowns. And the pluggers did just what their name suggests: they plugged cavities by condensing pieces of gold or amalgam to fill them.

Office of NIH History

Cleveland Dental Mfg. Co. Extracting Forceps
Early 20th century
02.0019.030 and 051
Donated by Brent Jaquet, National Institute of Dental and Craniofacial Research and the Dean Family

Often teeth could not be saved and had to be pulled. These extracting forceps were used to pull the tooth or roots out of the jaw. They are part of a fourteen piece set of right and left instruments designed by Dr. George B. Winter. Each was designed for a specific type of tooth; for example, some extractors were used on upper incisor teeth only.

Wilton Earle Tissue Culture Glassware Collection

Wilton Robinson Earle (1902-1964) began his career at the Hygienic Laboratory (later the National Institute of Health) in 1928. When the National Cancer Institute was created, Earle became one of its first employees, working there until his death. Earle was born in Greenville, South Carolina and attended Furman University, graduating in 1923. He received his Master's Degree from the University of North Carolina. In 1928, he received his Ph.D. from Vanderbilt University, where he began to study tissue culture techniques and develop his instrumentation skills. In tissue culture, single cells, groups of cells, or even whole organs from plants or animals are transferred to an artificial environment to live and grow. In the 1930s, tissue culture was in its infancy: cells grew in uncontrolled conditions and experiments produced irreproducible results. Earle, a unique combination of engineer and biologist, set out to make tissue culture a valuable tool to study cancer malignancies.

Over Earle's career, he and his co-workers developed many techniques adding to our knowledge of cellular function as well as cancer. These include mass cultivation of cells (used particularly in vaccine production), procedures for keeping cells uncontaminated, and cell growth in large 3-dimensional and suspension cultures. Earle generously shared his knowledge with scientists from all over the world.

During the late 1930s and early 1940s, Earle was working on four main problems: cloning single cells to produce pure strains; finding the best culture media; photographing and filming changes in cells; and establishing a strain of cancer from specially-bred mice ("C3H mice") which could be grown outside the body for research. One of the resulting cell lines, called "strain L" was cultured continuously for over 38 years, being used in cancer research around the world. Earle's mice cancer studies, along with George Hey's at Johns Hopkins Medical School, showed that cells could undergo malignant transformations *in vitro*.

These objects are a few Earle's in the Museum's collection; they reflect Earle's early research.

Office of NIH History

Carrel flasks (short stem, double stem, open top)
c. 1940
91.0001.004-040
Donated by Dr. Patricia Gossell, National Museum of American History, and the National Cancer Institute

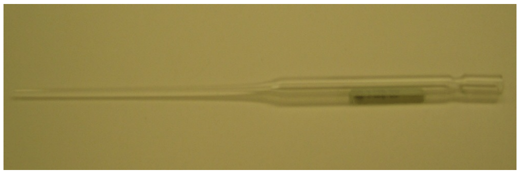
Alexis Carrel (1873-1944) was a noted French surgeon and early experimenter with organ transplantation at the Rockefeller Institute of Medical Research in New York. In 1912, he took a tiny piece of chick embryo heart muscle and put it in a nutrient medium in a flask of his own design. The heart tissue lived over 20 years in various of these flasks, now called Carrel flasks.

In a Carrel flask, a small piece of tissue was embedded in a plasma clot. The cells migrated from the tissue and divided, forming a tissue culture. The optical qualities of Carrel flasks permitted photomicrography to document cellular behavior and changes. Dr. Wilton Earle used these flasks in many of his experiments.

Office of NIH History

T Flasks
c. 1940
91.0001.047-071.00
Donated by Dr. Patricia Gossell, National Museum of American History, and the National Cancer Institute

T flasks were designed by Earle to prevent the loss of cells when culture medium was being renewed. T-flasks were made from glass tubing (thus "T" flasks) and designed with a conical tip. When the cells needed fresh medium, the T-flask was centrifuged to collect the free-floating cells in the conical tip, otherwise, the cells would be lost when the old medium was removed. Different flask sizes were available so that several quantities of cells could be grown. The T-flask was one of tools developed by Earle's section to control environmental factors in tissue cultures.



Office of NIH History

Capillary Pipette
c. 1940
91.0001.105.00
Donated by Dr. Patricia Gossell, National Museum of American History, and the National Cancer Institute

One of Dr. Wilton Earle's greatest achievements was cloning single cells to produce a colony of cells with identical genetic material. Such colonies could be divided and subjected to different biological, physical, or chemical factors. These factors' effects on cells could easily be studied *in vitro*. After many years of work, the first pure clone, NCTC 929L, was developed in 1948.

To isolate a single cell, a capillary pipette sucked up several cells. The capillary pipette then was heat sealed and scanned for well-separated cells. Segments of the pipette containing individual cells were cut into tubes. The capillary tube limited the amount of culture medium around a cell so the cell could condition the medium with its own metabolites. The capillary tube section was immersed in a larger vessel of culture medium such as a Carrel flask. This enabled a slow renewal of culture medium by diffusion and let cells (divided from the first cell) slowly migrate out the end of the tube into the flask.

Office of NIH History

Perforated Cellophane and Vessel with Glass Helices
c. 1940
91.0001.195 and 190
Donated by Dr. Patricia Gossell, National Museum of American History, and the National Cancer Institute

Office of NIH History

Earle's group sought to replace the plasma clot as the physical support for cells in culture. Cells became so embedded in the plasma that they were hard to see or to remove for experiments. The scientists instead used glass helices or perforated cellophane to increase the surface area for growth. More cells could be grown, cells could be more easily removed for other experiments, and cell growth and motion could more easily be photographed and filmed. These techniques were the forerunners of today's bulk commercial production of cell cultures.

Office of NIH History

Horse Bleeding Instruments
c. 1940
91.0001.156-157.00 and 91.0001.158-160.00
Donated by Dr. Patricia Gossell, National Museum of American History, and the National Cancer Institute

Cell cultures were started in chicken plasma clots. The cultures were fed by a medium composed of horse serum and/or filtered chick embryo extract mixed with a specified salt solution (now called "Earle's saline"). Earle and others later developed more chemically defined and standardized culture media.

To bleed a horse, a cannula, or hollow tube, was inserted into a vein or artery. During the insertion of the cannula, a trocar which had a sharp, three-sided point stiffened the cannula. The blood flowed through a rubber tube into sterile glass cylinders. Horses returned to work after a few days rest. The chickens bled for plasma were not so lucky; they supplemented the staff's meat rations during World War II.

Office of NIH History

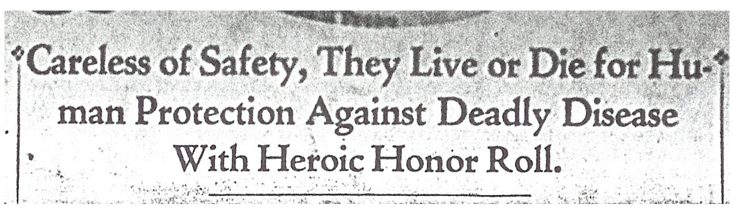
Carrel flask holder
c. 1940
91.0001.153 and 154
Donated by Dr. Patricia Gossell, National Museum of American History, and the National Cancer Institute

Designed by Dr. Frederick S. Brackett of the Division of Industrial Hygiene for Earle, these holders were used to secure a Carrel flask on the special microscope stage in a photomicrograph camera. The camera took pictures of living tissue cells in various types of flasks and media. During his career, Earle had several photomicrograph cameras designed and installed in his laboratory. He wanted to be able to photograph and film cells as they grew to compare normal to cancerous growth.

A Closer Look: "The G-Men of Science"

In February 1937, the *Washington Evening Star* began to run a 12-part series of articles entitled "G-Men of Science," by Lucy Salamanca. In the articles, Salamanca shadowed National Institute of Health (NIH) scientists and described their research. Whether Salamanca was invited to do the series or whether she approached the NIH on her own is unknown, but the articles served three important purposes for the agency. At the most basic level, they were public relations devices, with Salamanca's admiration for the physical bravery as well as intellectual acuity of the scientists painting a heroic picture of the NIH staff. Second, the articles were excellent vehicles for public education about specific diseases and general scientific concepts, from the necessity of thoroughly cooking pork to the latest knowledge about how cells work. And third, the articles, run in Washington, D.C.'s most influential newspaper of the time, were lobbying tools, reaching the important politicians deciding on funding for the NIH and its new construction at Bethesda, and on the creation of a National Cancer Institute. For us of the 21st century, the articles serve another purpose: they offer a look at the medical research done at the NIH during the 1930s from a distinctly 1930s point of view.

These purposes are nowhere better evidenced than in the first article of the series, in which Salamanca explains why the G-men of science are as important to public safety as the G-men of law enforcement–and perhaps more so. The article is quoted in its entirety below.


Careless of Safety, They Live or Die for Human Protection Against Deadly Disease With Heroic Honor Roll.

February 21, 1937, by Lucy Salamanca, *Washington Evening Star*, page F1.

> "Machine guns deliver a tattoo against the pursuing car. But the pursuing car diminishes no whit its desperate speed. It gains on the car ahead; it passes its murderous fire, and a Government agent levels his automatic at the man at the wheel. The man crumples in his seat, the car careens and roars and crashes into a roadside ditch. Public Enemy No. 1 of the times has been wiped out, and throughout the length and breadth of the land the spectacular capture is heralded amidst eulogies on the courage of the pursuer.
>
> "In a Washington laboratory a scientist leans again over his test tube, remarks the results with satisfaction. He writes in a notebook, 'Conclusion: It is apparent that___.' None of the elements of the dramatic chase are here, yet this G-man of science has just released a discovery that will [help] hundreds of thousands of lives, will protect human health and happiness to the farthermost boundaries of the civilized world.

“The G-man answering a machine gun’s fire has captured and imprisoned a criminal whose scope, at its most extensive, and even when augmented by gang associates, is as limited as human activities. But the G-man of science has captured, identified and put under control an agent of destruction whose diabolical activities are unlimited; whose powers to reproduce its kind are immeasurable, and whose sole occupation is the maiming and crippling and blinding and killing of humankind.

“Ruthless, insidious and unseen, this agent has worked. The leader of a notorious gang has been tracked for a year, two years, even three, by means of the clues supplied in a world of obvious and tangible elements. But the destructive agent in the scientist’s test tube has been pursued for more than a quarter of a century, half a century, perhaps, or the sum total of the lifetimes of many men, and has been tracked down by no other means at hand than infinite patience, singleness of purpose, devotion, industry unremitting to the point of sacrifice, plodding research, trial, error, inspiration and chance.

“The criminal brought to cover by the agents of justice has, it is true, been a potential menace. But doors could be bolted against him; he could, in the last analysis, be grappled with, hand to hand. Not so the fearsome forces imprisoned in the scientist’s test tube. They have been enemies against which no human being has been safe. They have invaded premises unsuspected; they have attacked in the dark; they have killed without warning. If society owes a debt of gratitude–as it assuredly does–to those brave men who risk life and limb in physical combat with criminals, how much greater is the debt it owes to the advance guard of science who have established barriers against destructive invasion by experimenting upon their own bodies, subjecting their own health and sanity and life to minute and ruthless combat with an unidentified combatant.

“We are interested in accounts of a neighborhood robbery or the fire set by some firebug in the next block. But we do not identify them with our own lives. Poliomyelitis, epidemics better known as infantile paralysis, leaving in their wake armies of helpless and crippled children; invasions of unnamed and terrifying diseases that decimate entire communities; the failure of the human heart to function; the slow decay of the human lungs; the merciless advance of cancerous growths; typhus, typhoid, influenza, tuberculosis, and an almost countless army of human ills and ailments–these are the things that pull us up straight in our chairs as we read. It is control of such forces that means everything to us.

“Nothing can be more dramatic than tracking down, identifying, and finally overcoming a deadly germ. Some of these stories back of scientific achievement we propose to disclose, to the end that you may know how far along the path of progress we have been carried by the men toiling in laboratories. To the end, too, that you may be assured by the outstanding conquests made in the realm of diseases, rare and common, and be apprised of what mankind may expect in the future with respect to longevity of life and soundness of mind and body.

“Scientists labor all over the world upon their specific problems, but no matter where their activities are undertaken, there is no center of progress in the fight against disease more fascinating or more productive of effort than in the Capital of the United States. Here, in the outlying fringes of the city [at 25th and E Street, NW], in an area where the naval hospital rears its red brick walls, is located the National Institute of Health, housed in a group of four buildings, comprising two brick laboratory buildings each two stories high with working basements, a large three-story stone laboratory, and a two-story stone library and administration building. Within these 160,000 square feet of floor space spectacular discoveries have been made in a very quiet fashion; the biological products for human use have been under test and controlled; outstanding results have been achieved with respect to studies in the prevalence and geographic distribution of hookworm disease in the United States; the carrier of Rocky Mountain spotted fever has been identified and a vaccine for inoculation against it devised; the plague-like organism of tularemia or ‘rabbit fever,’ identified; the transmission agent of typhus determined; outstanding discoveries made with respect to the nature and control of pellagra; facts and problems of rabies studied; milk in its relation to human health has been the object of intensive research with vitally important conclusions; a biological method for standardization of the thyroid hormone developed; chemical tests for blood made; a new vitamine [sic] brought to light; the adulterant causing ‘ginger jake’ paralysis identified; far-reaching studies made with respect to cancer and heart disease; malaria, leprosy, measles, tetanus, encephalitis, have been the objects of intensive research and experimentations, with highly important results.

“The past has witnessed the evolution of a considerable number of discoveries by the workers of the institute, of great value to this Nation, and some of them have been of world-wide application and have caused the rewriting of medical texts, as, for example the studies on anaphylaxis–the increased susceptibility of the body to toxic or remedial agents after a primary dose has been received into the blood; the treatment for acute mercurial poison.

“In addition to continued investigation into these and other subjects, the National Institute of Health is now engaged in nutritional studies that will directly benefit human life; the study of virus diseases and dysenteries [sic], the mutation of bacteria, meningitis, malignant tumors, scarlet fever, investigations into the chemistry of cell growth and cell division, studies with respect to the mottled enamel of teeth, and routine analyses and determinations that will affect in greater or less degree the health and life of mankind.

“Back of these discoveries are tales of heroism and intrepidity, dramas behind the scenes in the laboratories, where results alone have made the headlines. Medical men who have spent years of their lives in research in pursuit of an elusive fact, when finally they have run that fact to earth, have experimented upon themselves to ascertain its application. They have unhesitatingly inoculated themselves with vaccines and serums theretofore untried upon the human body. They have allowed themselves to be bitten by fleas carrying typhus and by mosquitoes to ascertain the origin of the deadly yellow fever; they have even swallowed the filtered sputum of patients to determine whether or not a disease is infectious.

"They have lost themselves in the tremendous humanitarian labors that occupy their lives to an extent that puts first the successful combat of the bacteriological enemies of man, to the exclusion of individual consideration. It seem in many instances of tireless, devoted labor, in the interests of the preservation of life and health and the prevention of the extension of the boundaries of disease, as if the bacteriologists, the physicians, the chemists, and that army of highly specialized scientists engaged in this work have replaced the first law of life–self-preservation–with the impersonal and divine law controlling the preservation of humanity.

"In Washington great names have shone forth, the light of their discoveries and their research shining even into the far corners of the earth. Stiles, Spencer, Badger, Dyer, Rumreich, Rosenau, Anderson, Lumsden, Kastle, Goldberger, Stimson, Hunt, Seidell, Taveau, Cedar, McClintic, Wheeler, Waring, Willets, Phelps, Stevenson, Shoub, Evans, Smith, Hendrick, Elvove, and others too numerous to mention, have distinguished themselves here for their scientific contributions. The list of worthy successors to Hippocrates, Galen, Vesalius, and the rest of the honor roll is long and weighty with the accumulated years of experience.

"Consider for a moment, that the National Institute of Health is an organization so young that its affairs, at first concerned only with maritime quarantine, in 1880, have grown now to include as provided by Congress, 'the investigation of infections and contagious diseases, and matters pertaining to the public health,' and that it has given to the world priceless knowledge in these fields in the short space of time that has elapsed since 1901, when the first congressional appropriation was made for buildings and 5 acres of land provided. Likewise, consider that at the present time not any country in Europe possesses better equipped laboratories for scientific investigation than the Washington Institute, nor that any single laboratory abroad can boast more extensive or diversified contributions from their findings within so short a period.

"Actually, the National Institute of Health is a field station of the United States Public Health Service, functioning under the administrative supervision of the Division of Scientific Research of that service. Under the surgeon general of the United States, Dr. Thomas Parran, jr., the Scientific Research Division is headed by Dr. L. R. Thompson. In his capacity as assistant surgeon general in charge of scientific research, Dr. Thompson is also director of the National Institute of Health. The institute is divided into the Division of Chemistry, under Dr. Hudson; the Division of Pharmacology, under Dr. Voegtlin; the Division of Zoology, under Dr. Hall; the Division of Infectious Diseases, under Dr. Dyer; the Division of Biologics Control, under Dr. Harrison; the Division of Public Methods, under Dr. Mountin; the Division of Industrial Hygiene, under Dr. Sayers, and the Division of Pathology, some of which investigation work is done in Washington and some in

Harvard University.

"Several years ago Mr. and Mrs. Luke I. Wilson of Bethesda, Md., gave 45 acres of ground to the institute, and since this time a sum of $1,463,000 has been appropriated for beginning construction of three buildings on the land to serve as the nucleus for the future center of activities. An administration building, a building to house the division of industrial hygiene and a building to house the division of public health methods will be begun in the very near future on the plot, and as soon thereafter as additional appropriations are allocated for the purpose two other buildings, to duplicate those now situate next to the Naval Hospital, will be erected on the site at a total cost of $2,500,000. At the completion of this new home for the institute in Bethesda the buildings now occupied by its activities will be turned over to the Naval Hospital for a medical center.

"The results of institute investigations are made available to the Nation by systematic publication of findings, reports, bulletins and other informative publications. These are widely distributed through the health centers of the country, special channels receiving literature that deals with specific problems, such as occupational diseases, duly routed, for example, to industry. Also, by means of lectures, health programs and in conjunction with medical societies and allied organizations everywhere, the knowledge is disseminated and put into practical use.

"The director of the National Institute of Health, Dr. L. R. Thompson, came into the Government service in 1910, associated with it in the study of pollution of the international boundaries between Canada and the Untied States. He also did work of this nature in Cincinnati. Later he was chief quarantine officer of the Philippine Islands and in charge of development work in industrial hygiene. In 1930 he was appointed assistant surgeon general in charge of the division of scientific research, and in February took his place as director of the National Institute of Health, whose activities he had theretofore directed.

"The institute is an outgrowth of the small bacteriological laboratory that was established at the Marine Hospital in New York in 1887 and was later transferred to Washington and named the Hygienic Laboratory. In 1930 Congress changed the name to the National Institute of Health under the provisions of a bill introduced by Senator Ransdell.

"Today a visit to the institute is a revelation. One enters laboratory after laboratory where men, and women, too, 'in white,' handle tubes of deadly germs, stoppered with nothing more than a wad of cotton wool, as nonchalantly as if they were playing with ping-pong balls.

"'What is in that one?' I inquire.

"'Meningococcus meningitis,' is the casual answer, delivered with a smile as the research worker shuffles the bottles.

“Behind the words I see another picture. A member of my own family had suffered meningitis during the World War. I can remember the terrifying descriptions whispered by the family in the presence of myself–then a child. Head snapped back. Spine shortened. Whites of the eyes showing, with the eyeballs rolled. And an endless list of potential deformities. Miraculously, in this familiar case there was recovery. But here before me at a long table are rows on rows of those slim glass tubes filled with the deadly, merciless agents of destruction. Bottled tragedies. Stoppered misery and horror. But here they are being made to serve the humanity they would destroy.

“Cages on cages of animals–white rabbits, lively little monkeys, scuttering white mice–experimental animals who will receive inoculations, undergo observation, that men may live. Operating rooms where animals, completely anaesthetized in every instance, are observed and studied for the preservation of humanity. Sterilizers, laboratory jars, and burners and bottles. And everywhere the slender glass tubes filled with death, rampant in watery yellow liquid, or floating curled yellow globules in the culture on which it feeds.

“Other rooms, where fleas hop about in little cages. ‘Every one in this wing, including the stenographer, has had typhus,’ by guide informs me, ‘derived from the bite of an escaped flea.’ And every one–that is, every one who did not die–is back on the job, experimenting, testing, typing reports, that men may be free of typhus in the years to come.

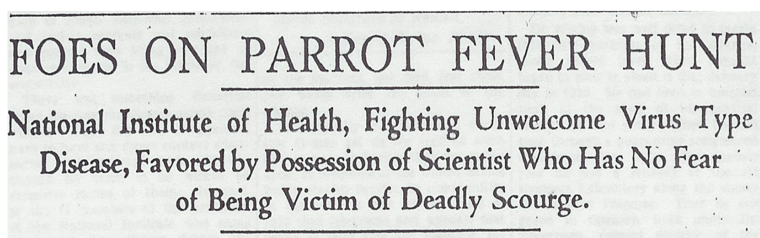
“Another room, where white rabbit wriggle pink noses and pink-lined ears. In here not long ago a young laboratory assistant, a young woman, was inoculating a rabbit with meningococcus meningitis. The rabbit, held by a young man, hopped suddenly. The syringe was pressed against the girl’s thumb. It did not pierce it, but a stream of meningococcus meningitis shot into her right eye. The eye was washed out with antiseptic lotions at hand. A few days later the girl was dead. But the research and experimenting goes on and the world is being made safer for the many.

“Other rooms–more ominous. Rooms shut off by heavy steel doors that are locked under lock and chain and combinations, for back of them are plague and pestilence and horrors that defy description should they be turned loose on a helpless world. Here I looked on bubonic plague, neatly bottled and corked. Similar germs, kept on ice for 14 years, when taken into the laboratory and fed on a new culture thrived and flourished and waxed virulent enough to wipe out a civilization.

“Then the room of ‘new diseases’–disasters so young that they have not as yet received a name, and so unknown that I am warned that here I enter at my own risk. ‘Are you afraid?’ I ask my guide. ‘It is my work,’ he answers quietly. ‘And this,’ I tell him, ‘is mine–telling others of your work.’ We enter.

"Where are the new diseases? Perhaps in the air. No one knows as yet. Or perhaps in those monkeys frisking in cages along the wall. Every where are earnest, absorbed men, in white frocks, fiddling with glass tubes, holding up cultures to the light. What are they doing? We are going to find out. One by one we will investigate these dangerous activities, look into these test tubes, open these heavy steel doors, watch these experimental animals. With men whose names are known around the world we will pierce the mysteries of these inimical agents and learn something of the noble accomplishments of our G-men of science."

After this introductory article, Salamanca focused on different researchers and diseases for the next eleven weeks. Her second and third articles described Dr. Edward Francis' years of research into tularemia and relapsing fever (fours months later, in July 1937, Francis narrowly escaped death from relapsing fever, his condition being followed in the newspapers). Following were articles on Dr. Rolla Dyer and typhus; Dr. Charles Armstrong and encephalitis; Dr. Roscoe Spencer and Rocky Mountain spotted fever; Dr. Maurice Hall and trichinosis; Dr. Ben Levine and cell mutations; Dr. George McCoy and psittacosis (parrot fever): Dr. Sara Branham and meningitis; Dr. Carl Voegtlin and cancer; and Dr. L. L. Williams and malaria.


FOES ON PARROT FEVER HUNT

National Institute of Health, Fighting Unwelcome Virus Type Disease, Favored by Possession of Scientist Who Has No Fear of Being Victim of Deadly Scourge.

April 18, 1937, by Lucy Salamanca, *Washington Sunday Star,* page F2.

Salamanca was clearly impressed by the physical dangers faced by the scientists, very real dangers which often resulted in serious infections and sometimes death. She listed the diseases each researcher had contracted during his/her work and described how the scientists often knowingly risked their own lives for their research. For example, in 1933, Dr. Charles Armstrong and other NIH scientists were called in to figure out what was causing an epidemic of "sleeping sickness" in St. Louis. After much basic research, Armstrong isolated the cause, identifying encephalitis as sleeping sickness. This feat involved self-experimentation: "The G-men of science, out after the cause of the epidemic, studied and discarded one theory after another. Odors from sewers, drainage ditches, animals brought into the city from other countries, sick hogs–all were suggested as possible origins of the disease. When large numbers of mosquitoes were found to exist in the areas involved, Dr. Leake, Dr. Armstrong and other laboratory workers, rolled up their shirt sleeves and stood quietly while the mosquitoes they placed on their arms filled with blood. But there were no after affects from these self-imposed mosquito bites." (March 21, 1937: "Federal Health G-Man Leads Sleeping Sickness Battle," by Lucy Salamanca, *Washington Sunday Star*, page F-1.) In another article, an anecdote about how McCoy, as director of the National Institute of Health in 1930, forbade anyone but himself to deal with the extremely contagious virus psittacosis (parrot fever) is retold twice. The ending sometimes cited is not told here–that he ordered the building to be so thoroughly fumigated that even birds flying overhead dropped dead. "'There are some diseases,' says Dr. Dyer, matter-offactly, 'that you just can't keep in a laboratory. It's impossible to handle them safely.'" The role of Jimmy the rat in the typhus laboratory is described by Dyer as "life insurance" because any fleas that escaped would prefer to feed on Jimmy instead of a scientist. (March 14,1937: "Typhus Investigator Exposes Self to Deadly Fleas," by Lucy Salamanca, *Washington Sunday Star*, page F-1.)

The scientists' matter-of-fact and humorous views of the dangers of their work made them seem brave instead of reckless. Or they could be driven by more spiritual aspirations: Branham, who was both a physician and a scientist, believed, "All the people in the world who have meningitis are my patients" (April 25, 1937: "Meningitis Now Under Fire: Scientific Experts of National Health Institute, Studying Cycles of Disease, Are in Search of Effective Serum and Hope to Save Lives in Vigorous Campaign," by Lucy Salamanca, *Washington Sunday Star*, page F-1). This global view became intensely personal when Branham's assistant Anna Pabst died from meningitis due to a laboratory accident.

As well as explaining research into particular diseases and the derr-doing of the scientists, the articles attempted to explain the scientific approach to problems, particularly in Voegtlin's lecture on cancer and cells. The scientists' own approaches to research were presented as well. "'You see,' says Dr. Francis, with characteristic modesty, 'we fellows don't find out those things because we're so smart. No...that's not the way we find things out. We kind of just putter around with this thing and that and try everything and make experiments on a hunch half the time. You have to use your eyes more than your brains. You can't think things out in a laboratory. You can't even have ideas. They might be the wrong ideas and set you on a wrong tack.'" (March 7, 1937: "Malignant Blue Ticks Producers of 'Relapsing Fever,'" by Lucy Salamanca, *Washington Sunday Star*, page F-1.)

Through Salamanca's articles, the NIH scientists' achievements were explained and celebrated for the general public and politicians. By their examples of perseverance and devotion to the health of all humanity, the NIH scientists were particularly good examples of public servants. But as Dr. Maurice Hall revealed, the scientists got personal intellectual satisfaction out their work. "'Parasites uninteresting? Why they represent the human ideal of existence. Life without work, sustenance without effort. There is nothing more fascinating than a piece of life that can get away with it.'" (April 4, 1937: "Trichinosis is Challenged," by Lucy Salamanca, *Washington Sunday Star*, page F-1.)

Chapter 5: Remembering the Early Days

Like older relatives, long-time staff members of the National Institutes of Health (NIH) like to tell stories about the past. Those staff who began at the NIH during or just after its move to Bethesda, Maryland are no exceptions. Their memories, like family stories, place the individual and institution in the context of history. On the most superficial level, these recollections encompass both the happy and mundane aspects of life on campus. Enjoyable memories include cantaloupe and orange sherbert lunches at the Bethesda Hot Shoppe, parties in the Wilsons' outbuildings, "Victory Gardens" on Cedar Lane, and picnics next to the stream.

On the other hand, there was no air conditioning, so when summer heat and humidity reached unbearable levels, employees were released early. Getting to the new campus was difficult for staff who rode streetcars and buses, but for those with cars, parking was ample, at least for the first few years. By 1949, employees began complaining that there was not enough parking–a familiar complaint 60 years later.

Office of NIH History

Long-time staff members compare the sprawling campus of today's NIH, with over 15,000 employees, to the bucolic campus of the late 1930s and early 1940s, with less than 1,000 employees. The Bethesda campus was larger and more self-sufficient than that at 25th and E Street, N.W., but small enough so that it still felt like a single entity. The core of the campus was Building 1. There staff ate in the cafeteria, did research in the library, picked up supplies at the supply store, requested help from the maintenance shops, attended seminars in the auditorium, and visited the director in his office. At lunch time, staff played horseshoes, tennis, or baseball behind Building 1. Eventually a baseball field was established there. This physical environment stimulated interaction between scientists in different Divisions and disciplines. The researchers learned of each others' work, discussing experimental methods and results. Today's NIH has no physical or scientific core: the physical plant is too large and scientists may not understand each other's specialities. In designing new buildings, however, the NIH tries to recapture some of the interaction of the past with centralized coffee and lunch rooms.

Other memories have meaning beyond pleasure and regret, mirroring the social history of the time. Life on the NIH campus reflected the realities of life in the segregated United States during the 1930s. Blueprints for Buildings 1-6 mark bathroom facilities only as "men" and "women," with no duplications on any floor to indicate dual facilities. The same is true of drinking fountains. But Dr. Herbert Tabor, a white scientist who came to NIH in the 1940s, recalled that in Building 4 it was common knowledge that certain restrooms were to be used exclusively by the African American staff. Jobs were highly differentiated by race; most scientists and administrators were Caucasian, while African Americans worked mainly as animal handlers, glass washers, and service staff.

In a 1995 interview in the *NIH Record*, Roskey Jennings, an African American who began working at the 25th and E Street, N.W. campus in 1930, stated: "I lined up many a day outside this building [Building 1]. They wouldn't let us eat in here [the Bldg. 1 cafeteria] then....I was with the first group that broke that down. I think it was Dr. Parran and some others writing and calling on our behalf. They didn't believe it was right. It finally got changed. I was glad to be here when it changed." (*NIH Record*, March 28, 1995, p. 7). It is unknown exactly when the policy changed.

In an earlier *NIH Record* interview (April 15, 1980, p. 3), Jennings fondly recalled "the noontime baseball games that were played where the Clinical Center now stands, even though 'colored' people were not allowed to then play." That restriction changed in 1949. Richard Mandel, author of *A Half Century of Peer Review, 1946-1996,* cited the minutes from a Luncheon Staff Meeting on May 26, 1949, reporting that: "employee baseball teams had voted to desegregate and that lunchtime games were now drawing substantial crowds and causing traffic jams."

By 1941, the NIH had finished the long move into its new laboratories on the hills of the Wilson family estate. There its staff expanded their scientific horizons and established new professional and social traditions. As time has passed, the original buildings have undergone several renovations and so many new buildings have been built that the Wilsons would not likely recognize their wooded knoll. But true to NIH Director Lewis Thompson's promise to Luke and Helen Wilson, the NIH remains committed to research to relieve the suffering of humanity.

A Closer Look: Personal Memories of the Early NIH

At a 1991 commemoration of the move to Bethesda, co-sponsored by the NIH Alumni Association and the Office of NIH History, some NIH alumni who participated in the relocation told their stories.

Office of NIH History

Dr. Margaret Pittman (at NIH 1936-1972, Division of Biologics Control)

"I came to NIH in 1936–55 years ago–when funds were made available by the Social Security Act of 1935. This permitted the Public Health Service to employ additional staff. I was hired at a grade GS-9, and my highest previous salary had been $2,500. There were only 325 employees at NIH. I know because I was asked to take up the collection for the Red Cross for three years.

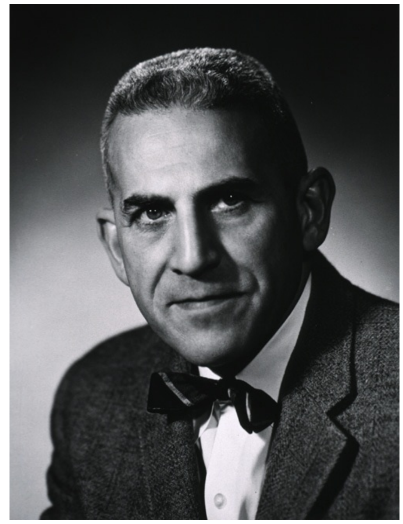
"My first work at NIH was with Dr. Sara E. Branham. She had been called there to work on meningitis. There was an epidemic in the United States, and I was to work with her on developing a mouse potency assay for antimeningitis serum. However, the test was not promulgated because the sulfonamides appeared about this time.

"The Biologics Control Laboratory moved from the 25th and E Street campus to Bethesda in the spring of 1941. We were the last ones to come out, but it was a beautiful time to move. Cherry blossoms covered the road. When we moved, I acquired my own research laboratory and took up my research on *Haemophilus influenzae* again–the organism on which I had worked at the Rockefeller Institute of Medical Research before I came to NIH."

Dr. Leon Jacobs (at NIH 1937-1979, Parasitic Diseases)

"It was a lot of fun working in those first few years at NIH downtown [25th and E Streets NW]. It had become NIH in 1930, but it was a very small place. After an institute seminar, for example, all of the scientific staff could go into the director's office for tea and cookies. The director, Dr. L.R. Thompson, a lovely man, was very influential in the establishment of NIH and bringing it to Bethesda.

"When we came out in 1941, we carried a lot of our own precious material with us. We had cultures of amoebae; we had various kinds of animals infected with various species of helminthes and protozoa. And we also had a piece of equipment that Dr. Charles Rees had developed. He had come on board in 1939 to work on amebiasis and had brought with him a piece of equipment called a micro-isolation apparatus, which was a jerry-built thing.



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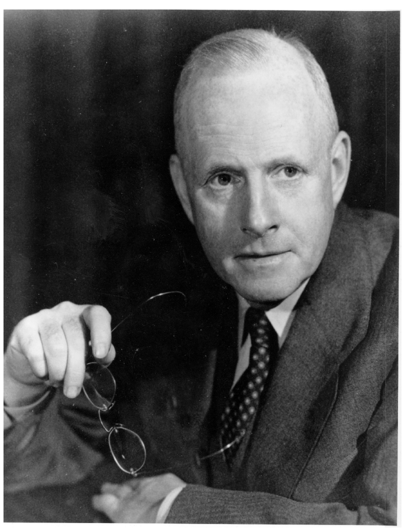
"Not all of us were very happy with the move. Not all of us had cars. If you tried to get out here on the streetcar and bus on Saturday afternoon to take care of some amoeba cultures, you were pretty unhappy unless you had a car.

"At the 25th and E campus, there was no cafeteria. The media room, which prepared all the media for the bacteriology group, often cooked hot dogs for lunch and sometimes made soup. I always figured that the soup was basic stock veal infusion broth with other things added to it.

"When we moved to Bethesda, we had a cafeteria in Building 1, as well as shops and a library. There was also an auditorium, so we no longer went to the director's office to have tea and cookies after seminars."



Office of NIH History

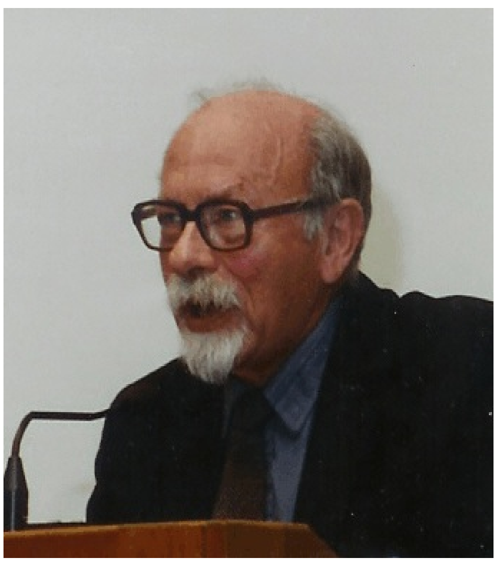
Dr. Harold Stewart (at NIH 1937-1969, Cancer Pathology)

"Cancer investigators assembled in the early years by Dr. Joseph Schereschewsky of the Office of Cancer Investigations at Harvard Medical School represented a diversity of scientific specialities. Included among us were biologists, geneticists, physicists, radiologists, biochemists, experimental cancer chemotherapists, and pathologists. Each worked individually on research projects of his own design and published independently. Equally important, all consulted among themselves, exchanged ideas, and helped one another. This spirit of cooperation among scientists established at Harvard under Shereschewsky shaped events that were to continue here at Bethesda.

"There were four of us pathologists: Drs. T. Hugh Grady, Stuart W. Lippincott, Jesse E. Edwards, and me. It had become obvious during the earlier years that there were inaccuracies in some of the published reports of the pathologic diagnoses and classifications of spontaneous and experimentally induced lesions in laboratory animals. To avoid errors, the entire NCI staff, with the approval of the director, Dr. Voegtlin, established the rule that any manuscripts that included pathologic diagnoses, descriptions, or illustrations of cancers or other lesions were to be reviewed by one another of us pathologists before submission for approval for publication. Incidently, this rule did not automatically confer co-authorship on the part of the reviewing pathologist.

"Prior to the establishment of the *Journal of the National Cancer Institute*, our scientific papers had appeared in a variety of publications. With the appearance of the first issue of *JNCI* in August 1940, this became the medium of choice for our publications.

"On December 7, 1941, Pearl Harbor was bombed. During succeeding months, many of the staff volunteered for military duty. Who, in our absence, would carry on the work of experimental pathology? The pathologist who replaced us was Dr. Thelma B. Dunn. It's often been said that it's better to be lucky than to be good. And that's what happened in this circumstance [they were lucky to get Dunn]. Dr. Dunn made remarkable contributions to cancer research from that time until her retirement in 1970 that earned for her the title, 'The First Lady of Cancer Research.'"


Office of NIH History

Dr. Joseph Leiter (at NIH 1938-1983, Carcinogenesis & Chemotherapy)

"I came to work at the NIH in 1938. Although I was hired only as a junior chemist, with no Ph.D. yet, I had the distinction of being personally interviewed by the first director of the [National] Cancer Institute, Dr. Carl Voegtlin, to give you some idea of the involvement of the directors in those days. I went to work in Boston at Harvard University with Dr. Murray Shear, who saw me for the first time when I showed up.

"Shortly after the National Cancer Act was passed [in 1937], at the first meeting of the National Cancer Advisory Council, Dr. Ludwig Hektoen, the first chairman, became alarmed at a two-fold increase in the incidence of lung cancer during the past 20 years. The members of the NCAC were sufficiently influential that Congress appropriated $50,000 to establish a program in lung cancer research and in the effects of environmental hazards on lung cancer. I was one of five professionals and 15 support staff hired for the program. The $50,000 covered all our salaries.

"Techniques in those days would horrify us at the present time. We used to use such innocuous menstruums as benzene and acetone to paint on the skins of animals to see if they produced tumors. We only used the S.S. Pierce's pure leaf lard as a menstruum for the carcinogens that were injected sub-cutaneously. A number of interesting concepts were developed in those days, despite the fact that our techniques were crude. Shear observed, for example, that sometimes when he painted the skins of mice with coal tar, he got an improvement in the carcinogenicity. He coined the term 'carcinogen,' that is, a substance which, in itself, did not produce cancer, but which promoted the development of cancer."

Dr. Lewis Sargent (at NIH early 1940s-1973, Chemistry)

Office of NIH History

"Chemistry at NIH comprised two separate divisions. The earliest one was headed by the late Dr. Claude Hudson, whose work mainly had to do with the chemistry of rare sugars extracted from various plant materials. The other division was involved in the chemistry of morphine and drug addiction. It became part of NIH in June 1939. Designated as the Laboratory of Medicinal Chemistry, it moved to the Bethesda campus in May 1941, and was incorporated into the Division of Chemotherapy.

"When we got into the war in December 1941, we were put on a six-day, 48-hour work week. During that period, Wilson Hall in Building 1 became a blood donation center, and we were expected to report every 3-4 months to be relieved of a pint of blood.

"Our buildings were patrolled by armed guards at night, and the single entry road to the campus from Wisconsin Avenue had a gate-house and a railroad-like barrier. For a while, we had two interesting night watchmen. One, a Swiss, could always be counted on to look after certain chemical reactions left running overnight.

"Despite the frenetic activity in the lab, there occasionally was time for a noon-time softball game on the long-gone diamond in back of Building 1. We were all aware of how uncomfortable Washington summers can be. Since the original six buildings were not air-conditioned, we often worked stripped to the waist in the lab. Another item of interest is the string of so-called Victory gardens that stretched along Cedar Lane from Rockville Pike nearly to Old Georgetown Road. These were really happy days. We worked very hard but also had fun."

Dr. Jesse Edwards (1940-1942, National Cancer Institute)

"I came to the National Cancer Institute in July, 1940, after having completed my Residency at the Mallory Institute of Pathology of the Boston City Hospital. When I arrived, I joined the Pathology Department of the Cancer Institute. Dr. Harold ('Red') Stewart was the Chief. The other two pathologists in the department were the late Dr. Stuart Lippincott and Dr. Hugh Grady.

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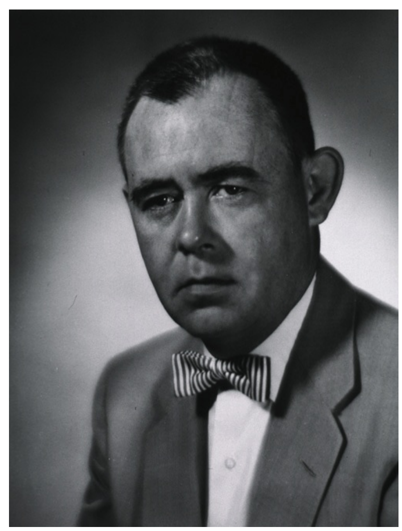
"At that time, the Cancer Institute was located in one of about five or six buildings set among the grass and the trees. The general appearance was that of a small, New England campus (no Clinical Center, etc.). There was considerable interplay between the various people in other fields, on one hand, and the Pathology Department, on the other. My own field at that time was experimental liver cancer. People with whom I collaborated were H.B. Andervont, Julius White and Albert Dalton, among others."

"The attitude was initially 'low key,' reflecting the New England campus attitude. In the fall of 1940, the National Institute of Health was dedicated by then President Franklin Roosevelt. It was amusing later to notice in photographs of the President doing his dedication that someone had forgotten to remove a broom during the pre-ceremony clean up, the broom occupying a place almost as prominent as did the President."

Dr. Thomas Kennedy, Jr. (1941, 1950-1974, Industrial Hygiene)



National Library of Medicine

"As a freshman medical student matriculating at Johns Hopkins in the fall of 1940, I had the opportunity to participate in the research activities of a highly regarded young associate professor of medicine, George W. Thorn. War was in the air and his laboratory had just begun a new research program in aviation physiology. When Dr. Thorn learned that I wanted to continue to do research during the upcoming summer of 1941, he suggested that rather than endure the seamy and steamy environs of East Baltimore, I instead live at my home in Washington and work on a research project that he was carrying out in collaboration with a member of the staff of the NIH, Dr. Ben Jones. Thus, June, July and August found me commuting daily from my home in northwest Washington to the basement of Building 2.

"The research related to the role, if any, of the adrenal cortex in physiological adaptation to high altitude. The subjects were rats and macaques. Altitude was simulated in a decompression chamber, located in the areaway at the northeast corner of Bldg. 2. I learned to operate the chamber, to manage the animals, to draw blood samples and to measure blood gases. By today's standards, the available repertoire of techniques was thin and the methods primitive. But it would be many years before this technology improved, and so the know-how I acquired on how to run a Van Slyke manometric blood gas analyzer stood me in good stead in later years.

"Some recollections:

"....Excursions to a large primate facility that must have stood just about where the main entrance to the Clinical Center is now located. Stepping inside, you would encounter the terrifying spectacle of scores of monkeys, leaping at breakneck speed and wild abandon all around and about you. The 'zoo-keeper,' a famous campus character, would stand serene and unperturbed amid the chaos until the specific beast we had come to fetch came close; then, in one incredibly swift and deft move, he would snare it with an oversized crabbing net.

"Lunches in Bldg. 1, where the elevator trip to the third floor was always an adventure.

"Treks to the Bethesda Hot Shoppe for everyone's favorite lunch: half a cantaloupe, filled with a big scoop of orange sherbet.

"Results of the summer's research were published long afterwards. For my efforts, I received the then usual reward, an acknowledgment, in a footnote, for technical assistance. But my most unforgettable memory—maybe nightmare–of the summer was of the day the monkey escaped. The technique we had been using to transfer animals from cage to operating table for bleeding was neat and generally reliable and safe.

"However, one afternoon it failed and, with a monkey loose in our lab, someone–unaware of what was going on–opened the door to come in. In a split second, the escapee bounded out into the corridor and headed straight-away toward the light at the south entrance of the building. His last great leap to freedom, however, was made before recognizing the almost invisible barrier of a heavy plate glass door. Dazed for a moment by the unexpected encounter, the animal sat briefly still.

"But when he saw us charging down the corridor in hot pursuit, he made a bee line for the nearest opening, which, unfortunately, turned out to be the laboratory of a somewhat reclusive biologist, Dr. Alex Hollander, who was studying the genetics of fungi. The walls of his lab were covered with shelves, on which Petri dishes in countless numbers were neatly stacked. The frantic monkey went from floor to table-top to shelves in a twinkling, and round and round...The havoc wrought was indescribable.

"I met Dr. Hollander 25 years later at an MIT retreat. Luckily, he did not recognize me."

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Photographs of the objects in "A Closer Look: Scientific Instruments of the 1930s" may be requested from the Curator of the DeWitt Stetten, Jr., Museum of Medical Research at museum@nih.gov. For images from the National Museum of American History, please contact the Division of Medical Sciences at that museum.

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LINKS

For more information about the National Institutes of Health in the early 20th century, see these Office of NIH History web sites:

Dr. Joseph Goldberger & the War on Pellegra
http://history.nih.gov/exhibits/Goldberger/index.html

Drugs as Opiates, Drugs as Research Tools
http://history.nih.gov/exhibits/opiates/index.html

A Short History of the National Institutes of Health
http://history.nih.gov/exhibits/history/index.html

Notable Contributions to Medical Research by Public Health Scientists
http://history.nih.gov/articles/Notable_Cont_Med_Research.pdf

National Institute of Allergy and Infectious Diseases Intramural Contributions, 1887-1987
http://history.nih.gov/articles/NIAID_Intramural_Contributions.pdf

Selected Research Advances of the National Institutes of Health
http://history.nih.gov/01Docs/historical/2020a.htm

NIH Institutes, Centers, and Offices Timeline
http://history.nih.gov/01Docs/historical/2020c.htm

Online Historical Resources About the NIH
http://history.nih.gov/01Docs/historical/2025b.htm

For Teachers: The Fluoride Story and Public Health Education Lesson Plans

These lessons plans were created by the staff of the Office of NIH History. One plan examines the story of the fluoridation of drinking water, from the science to current social and political issues. The other examines why and how the government tries to educate the public about health problems, and how this effort has changed over time. Both of these lessons can be used in either history or science classes and satisfy the following Maryland State Curriculum Standards.

Topic: Critical Thinking

Indicator: Modify understandings of scientific ideas based on new information.

Objectives:
. Access and process information from print and non-print resources.
. Discuss new information relevant to the scientific idea presented.
. Compare, independently, new information collected to prior knowledge.
. Verify or modify prior understandings based on an analysis of new information.

Topic: Applications of Science

Indicator: Apply scientific concepts to defend a position relative to an issue.

Objectives:
. Use what they know and have learned to identify and describe a science-related issue.
. Collect and evaluate additional scientific information.
. Identify and explain the scientific concepts that can be used to make a decision about an issue.
. Analyze and compare advantages and disadvantages of possible decisions about an issue.
. Use scientific information to make and defend a decision about an issue.

Topic: History of Science

Indicator: Explain how people from ancient times to the present have investigated the world around us, answered scientific questions, and invented things.

Objectives:
. Describe achievements of men and women of diverse ethnic and cultural backgrounds and people with disabilities who have made various contributions to science and technology.
. Evaluate the historical impact of various scientific and technological contributions.
. Describe the evolution of careers in biology, chemistry, physics, Earth, space, and environmental science due to advances in science and technology.

“70 Acres of Science: The NIH Moves to Bethesda,” Lesson Plan #1
Focus: Public Health Education

Objectives:
- To learn about the significance of “public health”
- To learn how the U.S. government educated its citizens about public health concerns in the 1930s
- To research how the U.S. government and others (such as drug companies) educate citizens about public health concerns today
- To create sample public health education campaigns for current health issues
- To understand that even though some public health concerns of the 1930s are not relevant today, many are still important.

Vocabulary:
Public Health - The science and practice of protecting and improving the health of a community, as by preventive medicine, health education, control of communicable diseases, application of sanitary measures, and monitoring of environmental hazards.

What is public health?
Start a discussion with students about public health education. What kinds of health issues are raised by “public service announcements” on the radio or television, by “Back to School Special” type programming, and on billboards and signs at bus stops or on other public transit? Bring up some examples to get the conversation started such as:

. “Seek Truth” (stop smoking campaign)
. “Just Say No” to drugs/ “this is your brain on drugs,” etc.
. “Got Milk?”
. “Friends don’t let friends drive drunk”/ “drinking and driving can kill a friendship”
. “Five a Day” (fresh fruits and vegetables)
. “Back to Sleep” (placing infants on their backs to sleep)

Some topics of discussion might be: what are the health issues in these ad campaigns? Who sponsored and paid for these ads? What role might government agencies take in these kinds of education campaigns? Why might we consider smoking, for example, a *public health* issue rather than an *individual health* issue? What is the difference between an advertisement for a drug (such as ambien, nexium, etc.), and a public health service announcement? Point out that many public service announcements focus on other subjects (i.e. “Only you can prevent forest fires”) but that health issues are some of the most common subjects.

Ask students to discuss the most important public health concerns today. How did they learn about these issues?

What is the U.S. Government's role in public health education?
In the United States, the Department of Health and Human Services oversees and funds public health education through two agencies: the National Institutes of Health (NIH) and the Centers for Disease Control (CDC). Though the NIH is primarily concerned with health-related scientific research (on issues such as cancer, diabetes, etc.), the agency also creates and distributes public health education materials for parents, caregivers, children, and the general public. (Distribute some examples).

What are some reasons for public health outreach?
Discuss the reasons for public education on health and medical issues. The most general reason is to teach people how to prevent a particular disease. Other reasons, all illustrated in "70 Acres of Science," are listed below. Have your class think of examples of each from their own experience, and find examples of each from the website.

To make people aware of treatment options
To calm the public
To warn the public
To give information about what a government agency is doing
To answer a general public concern/interest in a topic
To inform a specific segment of the population about laws, treatments, etc.
To get participants for clinical trials
To encourage careers in science
To reach minority populations with information specific to their circumstances
To raise money for research
To change industrial/production procedures
To teach favorable habits to children
To show medical procedures and explain scientific concepts
To celebrate the achievements of scientists

Worksheet
Once there is a general understanding of what issues are important and why we as a society, for example, are concerned with peoples' health in general, start moving the discussion to how things might have been different in the 1930s (or any historical period). The web exhibit "70 Acres of Science" will introduce students to (among other things) public health issues of the 1930s and 1940s. For the purposes of this lesson plan, the students should focus on the issues raised in the website about public health education. Have the students go through the exhibit and complete a worksheet that will highlight areas of interest. Then split into small groups or, as a class, discuss the different answers to the questions:

What types of public health topics were important in the 1930s? What issues might have been less important than today? Much of the public health outreach focused on educating people about vaccinations, general good hygiene, tuberculosis, and venereal diseases such as syphilis.

What types of public education outreach tools were utilized in the 1930s? Before TV and the internet, how were people reached? Public health education outreach in the 1930s included newspaper and magazine articles, government publications, radio programs, Public Health Bulletins, posters, person-to-person training, schools, exhibitions, parades, movies, speeches, cartoons, and comic books.

Using specific cases from the web site, give examples of how the public was educated about certain diseases or conditions. These include all of the newspaper and magazine articles but especially Lucy Salamanca's articles; Thompson's manuscript for the PHS public brochure; Roosevelt's speech carried on radio; the milk codes, mercury level warnings, etc.; the posters for "Once a Year for a Lifetime" X-ray campaign, malaria control, Christmas Seals and tuberculosis, etc.; the health inventory taken by the Public Health Methods; the classes in dental hygiene in schools; the small pox exhibit, portable display of privies, shop window displays of privies, and World's Fair exhibits and health inventory; movies on cancer and dental hygiene, etc.

Give specific examples of how the public is educated about health issues today. Some examples of today's public health education are television programs, web sites, public service announcements (PSAs), commercials by pharmaceutical companies for conditions like high cholesterol or mental disorders, and advertisements.

How do advertisements increase public knowledge of health issues? What might be the problems in relying on television ads to protect the public's health?

Go online and find some websites that talk about public health issues. Make a list of public health advertisements while watching TV at home, while riding on public transportation, or while listening to the radio. Discuss.

Activity: create your own Public Health Education Campaign:
Have students split into groups to create their own public health education campaign. Students must research the issue and create a campaign that addresses the important points in an easy-to-understand way. The goal of the campaign will be to educate the public about a specific health concern. Either assign topics or have the students choose within their groups. Students can choose something from another era but must tailor their project to fit the appropriate audience (children, elderly, smokers, students, coal miners, etc.) Below are some ideas to start with:

Posters for busses, subways, etc.
Website
Comic book
Mini-exhibit to display at train stations, airports, etc.
Radio or television spot
Newspaper articles

Examples:

NIH Radio Station Public Service Announcements
http://www.radiospace.com/nihhome.htm
Visit this site to listen to or read various radio PSA's

NIH Word on Health – Consumer health information
http://www.nih.gov/news/WordonHealth/

Office of National Drug Control Policy – Television spots
http://www.mediacampaign.org/mg/television.html

National Institute on Drug Abuse, NIH – series of PSA's related to drug abuse in children and adults
http://www.drugabuse.gov/drugpages/PSAHome.html

Visual Culture and Public Health Posters
National Library of Medicine, NIH – This online exhibit is designed to introduce you to the history of images used in public health posters in the twentieth century. It utilizes the world's largest collection of poster art dealing with questions of health in the United States, housed at the National Library of Medicine. Many of these images can also be viewed through the Images from the History of Medicine (IHM) homepage.
http://www.nlm.nih.gov/exhibition/visualculture/vchome.html

Images from the History of the Public Health Service
http://www.nlm.nih.gov/exhibition/phs_history/contents.html#about
The photographic exhibit, "Images from the History of the Public Health Service," consists of 165 photographs depicting people involved in the work of the Public Health Service (PHS) over much of its long history. For the most part they are fleeting images frozen in time by the lens of the camera, but they are symbolic of much more -- the spirit of a Federal agency whose mission focuses on care and service.

“70 Acres of Science: The NIH Moves to Bethesda,” Lesson Plan #2
Focus: The Fluoride Story

Objectives:
To learn about how scientific research was conducted in the 1930s & 1940s
To learn about the history of dentistry
To understand the role of the Public Health Service in protecting Americans’ health
To understand both sides of the controversy over adding fluoride to America’s drinking water

Vocabulary:
Dental caries: destruction of the tooth; tooth decay, commonly referred to as “cavities”

Enamel: a smooth hard layer that protects the tooth

Epidemiology: the study of how and where diseases occur in a specific community

Fluoride, or fluorine: an element that naturally occurs in water and some foods and is used in industrial settings in metal refineries as well as in the production of glass, plastics, and ceramics.

Mottled: stained or spotted

ppm (parts per million): the unit of concentration of a substance in air or fluids

Story:
In the United States of the early 20th century, most people lost most of their teeth by the time they were 40 years old. In the 1930s, NIH (National Institute of Health) scientist Dr. H. Trendley Dean performed experiments showing that the chemical fluoride helped prevent dental carries in children’s teeth. This led to the recommendation to add fluoride to America’s drinking water, a process that began in Michigan in the 1940s and continues to this day, in the attempt to save millions of children from the pain and suffering caused by cavities, dental fillings, and teeth pulling. However, some people are concerned about the toxic effects of fluoride and prefer to drink non-fluoridated water. They object to the government adding this element—known to be dangerous when ingested at high levels—to the public drinking supply.

The story of how fluoride came to be added to drinking water is an example of how scientists looking for one thing sometimes stumble upon something completely different. It is also the story of how some chemicals commonly thought to be poison can in fact have healthful uses. The story will raise questions about individual rights in matters of public health. How far can the government go to protect us? What rights do people have to make their own health decisions? How might things have changed from the 1940s to the 2000s?

Background:
The story of fluoride and drinking water actually begins with mottled teeth. This phenomenon was first described in 1901 by dentists in both Italy and the United States. Dr. Frederick S. McKay noticed that many children living in and around the mining town of Colorado Springs had stained, spotted teeth, a condition he called "Colorado Brown Stain." In 1909, he lured renowned dentist Dr. Greene V. Black to the area to help him study the problem.

Preliminary testing of the water, with what turned out to be inadequate tests, found no known chemical that could be blamed for the staining. However, the problem started showing up in the dental literature in other mining towns in states such as Arkansas and Idaho. When H.V. Churchill, the chief chemist at the Aluminum Company of America, read about the problem, he decided to help solve the mystery. At his disposal were tools to perform much more sophisticated tests on the water than McKay and Black had been able to do previously. The new tests turned up unusually high levels of a chemical called fluoride in the drinking water of Colorado Springs, Bauxite, Arkansas, and Oakley, Idaho. Was this a coincidence?

Children with stained teeth living in small towns out West failed to capture the attention of East-coast researchers until the late 1920s. Dental research was not well funded at the time and not many large studies took place. However, in 1928, the National Institute of Health (NIH) in Washington, D.C. began to conduct studies on tooth discoloration and cavities. In 1931, Dr. H. Trendley Dean became a one-man Dental Studies Unit and set out to solve the mystery of Colorado Brown Stain.

Dean wanted answers to many questions: Was fluoride really the only cause of mottled teeth? Why was it worse in some areas of the country? How much fluoride would need to be in the water to cause the problem? And, of course, what could be done?

The dentist went to work examining children's teeth, taking water samples, and talking to local and state health officials in the effected areas in Colorado, Idaho, and Arkansas. He started to notice something surprising: though the mottled teeth were stained, they were otherwise healthy and in fact *less* prone to dental caries than the teeth in "normal" children. This discovery led Dean to ask new and unanticipated questions about fluoride. Was fluoride actually protecting teeth from cavities? Was it possible to find a level of fluoride which would protect teeth from cavities without staining and spotting? At what levels, in other words, would fluoride be helpful, and in what levels was it dangerous?

There was no accurate way to measure levels of fluoride in the water. He asked a fellow NIH Division of Chemistry scientist, Dr. Elias Elvove, to come up with a usable technique. The new method used a colorimeter. This type of test can measure the levels of a known element in water by comparing the color to a standard solution of that element. Using colorimetry, then, Dean determined that 1 ppm (part per million) of fluoride in drinking water would prevent cavities without causing stains.

A young government dentist had not only solved the mystery of Colorado Brown Stain, but was well on the way to solving the nationwide problem of dental carries in children! However, without massive testing, Dean was unsure of the large-scale and long-term results of adding fluoride to drinking water. Even in small amounts, could fluoride make people sick? Before asking state governments to add the chemical, he had to know more. In the mid-1930s, NIH dental scientists Drs. Frank McClure and Francis Arnold helped Dean to broaden the research in order to determine the effects of fluoride on the human body.

Dean also had to figure out how to *remove* excess fluoride from water systems in towns such as Colorado Springs. Officials in cities and towns across the country were worried about high levels of fluoride in the water causing Colorado Brown Stain in their locations. While Dean was studying how to safely *add* fluoride to the drinking supply, many public water boards acted to *reduce* the amount of fluoride in their water so as to reduce the mottled teeth experienced by their citizens. They could often easily do this by switching water sources. For those towns that could not change their water supply, Dean and his colleagues came up with a way to use manganese to reduce fluoride in water.

Fluoride research continued back in Washington. Dean's colleagues at NIH, Drs. Henry Klein and Carroll Palmer, believed that fluoride not only protected teeth from cavities but also actively inhibited tooth decay. The scientists grew excited about the possible ramifications of their research. These studies could lead to widespread improvements in the dental health of Americans. Dean himself focused on epidemiology: he learned where in the country cavities occurred and correlated that information with statistics about the water supply on a nationwide level. Using a 26-state 1933-1934 dental survey of American schoolchildren sponsored by the American Dental Association, Dean used maps and graphs to plot the incidences of dental problems against the levels of fluoride in the drinking water. These studies solidified his belief in the correlation between healthy teeth and small levels of fluoride. He found that a level of fluoride of 2.5 ppm caused mottled teeth, while his recommended level of 1 ppm prevented cavities without staining or other problems.

In 1938, Dean proposed an epidemiological study of his own. He wanted to do a test to see if the amount of dental caries in a town would decrease when fluoride was added to a town's drinking water. Would Dean be able to help children avoid the pain of cavities and teeth removal? Generations of Americans had dealt with dentists who knew little more than how to pull teeth, resulting in swelled gums, bloody mouths, and intense pain. Maybe this was a way out. William Randolph Hearst, the famous newspaper editor from California, sent reporters to cover the story for a waiting public.

But the public had a long time to wait. It would be ten long years until the results from this study became available. Dean had to set up his experiment with great care, to insure clean results. First, he had to prove the relationship between a bacteria that was known to cause dental caries (*L. acidophilus)*, mottled teeth, and fluoride levels in drinking water. This time, he used surveys in

21 cities. By 1942, Dean had convinced himself that 1 ppm of fluoride would bring the best results in protecting teeth.

Next, he had to prove that adding fluoride to a town's drinking water would cause no harm to its citizens. In the early 1940s he demonstrated, using evidence from two towns, that fluoride in drinking water at the level of 1ppm caused no ill effects. He showed that the citizens of Bartlett, Texas (which had high levels of fluoride) and Cameron, Texas (which had low levels of fluoride) demonstrated no harmful side effects from drinking water. During the same period, his NIH colleague McClure also studied the chemical fluorine's affects on bones. Using army recruits and teenage males as his subjects, McClure showed that fluorine did not injure the bone structure, as had been feared.

By 1944, all was set to find two cities to cooperate with the government's study. The two localities had to be places that had no previous evidence of fluoride in the drinking water. In one city, fluoride would be added. In the other city, the water would be kept free of the chemical. The scientists chose to do the study in Michigan because the state health department, in charge of all the water treatment, control, and personnel, agreed to participate with no legal obstacles. Grand Rapids, with its large and stable school population would receive the fluoride. Muskegon would serve as the control city, or the one that did not change its water supply.

Dean designed the study to answer questions about the effects of the fluoridated water on both baby teeth and permanent teeth. He wanted to learn *how* fluoride protected teeth from decay, and he wanted to learn more about the technicalities of artificially adding fluoride to water. Would artificially fluoridated water prove to be as effective as naturally fluoridated water in inhibiting tooth decay?

When school opened in the fall of 1944, the children were given teeth exams and saliva tests for bacterial counts. This examination would provide a base line for the study. On January 25, 1945, at 4 p.m., W.L. Harris, the chief chemist of Grand Rapids, oversaw the addition of the first fluoride to the city's drinking water. For the first time, a city acted to add a chemical to drinking water not to treat the *water*, but to treat the *drinker*. The study had begun.

The results of the Michigan study showed that children in Grand Rapids got fewer cavities than those in Muskegon. The Public Health Service reported no harmful effects as a result of the fluoridation. Dean and his NIH colleagues had triumphed! Even before the end of the study, more and more cities began adding fluoride to their water in the hopes of protecting future generations from dental cavities. By the 1980s, about half of the public water supplies in the United States were artificially fluoridated.

However, like most scientific results, this study had its challengers. Many people believe that the Public Health Service exaggerated the claims and began to unnecessarily expose the entire population to fluoridated water for the benefit of only part of the population. Fluoridation delays tooth decay rather than prevents it, so as children get older they lose some of the beneficial effects.

Also, fluoride can be naturally ingested from several foods, from pollution, and other sources, putting people well above the 1 ppm limit. In states with heavy industries such as aluminum, phosphate, and uranium enrichment, fluoride levels in the air and water are quite high. Fluoridation opponents point out that there are other ways—fluoride tablets, topical toothpastes, improved diets, improved dental hygiene—to reduce dental carries in children without exposing the rest of the public to the potential dangers and unknown properties of fluoridated water. Many countries, such as Sweden, Scotland, and Australia, have banned artificial fluoridation because of worries that adding the element to water will eventually prove to have been a toxic mistake.

Today, the National Institute of Craniofacial and Dental Research at the National Institutes of Health, together with the Centers for Disease Control, unambiguously support water fluoridation and the work of Dean and other mid-20th century researchers. However, a vocal contingent continues to question the government on this issue and support further studies on the effects of fluoride on bone density; on the levels of fluoride pollution from factories and heavy industry; and on new ways to reduce dental carries in children.

Classroom Discussion:

Dean's fluoride-dental carries study began in 1931 and took decades to complete. Why does scientific research take so long?

If a study like the one the NIH did in Michigan were conducted today, how would the public react? What would they want to know?

What public health issues are important now, 70 years after Dean's dental research began?

Questions for further research:

What other measures besides adding fluoride to water can decrease dental caries? What could the government have done instead of promoting fluoridation? What is done in other countries? Does the United States have lower levels of dental carries than Europe? What other measures besides adding fluoride to water can decrease dental caries? [Using fluoridated toothpaste at least twice a day, taking fluoride tablets calibrated at a dose compatible to the amount of fluoride in the water, and getting a fluoride rinse at the dentist.]

What other chemicals are added to the water supply? Why?

What are some other examples of government-funded studies using people as subjects?

Classroom Activity #1
Objectives:
Students will learn that fluoride helps protect teeth against decay.
Students will make observations of chemical reactions.

Materials:
Fluoride solution (available from a dentist, dental supply company, or some pharmacies)
Vinegar
2 Hard boiled eggs
3 Clear containers
Science journals
Pencils

Instructions:
1. Have the students take out their science journals to prepare for the experiment.
2. Place one egg into a container and pour in enough fluoride solution to cover it.
3. Let the egg soak for five minutes. Remove the egg.
4. Pour four inches of vinegar into the remaining two containers.
5. Place the treated egg into one container of vinegar, and the untreated egg in the other container.
6. Ask the students to carefully observe the reaction in either container. The bubbling in the container holding the non-treated egg is a chemical reaction between the acid in the vinegar with the calcium of the eggshell. The acid is dissolving the untreated eggshell. The fluoride treatment protects the one egg's shell from the acid, while the acid attacks the untreated egg's shell. Our teeth are similarly protected from the acids in our mouths with fluoride.

(Adapted from "Lesson Five: Fluoride Power" by Oral-B,
www.oralb.com/learningcenter/teaching/lesson5.asp)

Classroom Activity #2
Conduct your own epidemiological study in your classroom. Have the students interview each other about where they were born and where they grew up. Then, based on the "Decayed, Missing, and Filled" chart developed at NIH in 1937, have them ask each other about their dental histories. Using charts of fluoride amounts in water, have the students compare the dental health of those raised in places with high concentrations of fluoride in the water and those with low concentrations. For Virginia fluoride levels, use www.vahealth.org/teeth/servden.htm. For other states, contact the local Department of Health. Fluoride levels for many countries can be found on the web.

Classroom Activity #3
Find out the concentration of fluoride in the water in your community. Is fluoride added to your water supply and if so, when did that start? Is there data to suggest that this decreased dental caries in your area? If fluoride is taken out of your water system because there is too much in the

drinking water, find out how that procedure works. If you live in an area with no public water, how do dentists in your area give fluoride treatments? How do they figure out the proper amount of fluoride to prescribe?

Classroom Activity #4
There is much controversy about adding fluoride to drinking water. Ruth Roy Harris' book *Dental Science in A New Age: A History of the NIDR* (Montrose Press, Rockville, 1989) describes some of the legal battles. A search on the internet will provide many more examples of scientists and members of the public who are opposed to water fluoridation. Investigate the situation for your area: has fluoride been added to the water? If so, how was that authorized? What does each side have to say? After reading the materials, what do you believe? How do you decide the reliability of information found on the internet? Did the government do the right thing by advocating fluoridation in the 1960s? Is it the right thing to do today?

Classroom Activity #5
Use water testing kits to test the water in your school, water from childrens homes, and/or water from a stream or other natural source.