The McDonnell Center for the Space Sciences, founded in 1974 through gifts of nearly $5 million from the McDonnell Aerospace Foundation, firmly established Washington University as a major center for the study of the universe. The work of the center crosses traditional disciplinary lines, although most of its twenty faculty members hold appointments in the departments of physics or earth and planetary sciences.

The principal interest of Dr. Robert Walker, McDonnell Professor of Physics and director of the Center, is the radiation history of extraterrestrial materials. A principal source of study are the tracks left in meteorites by the explosion of uranium atoms billions of years ago, which are viewed through optical and electron microscopy. Walker played a key role in developing techniques for "fossil track" detection. This starburst is made up of tracks left by induced fission of a uranium 238 atom in a speck of dust.

Meteorites, which have been travelers in space since the birth of our solar system and yet have remained relatively unchanged, bear direct evidence of specific events during the formation of the system. Dr. Walker has also studied the history of the solar system through rocks brought back from expeditions to the moon.
### Washington University Magazine

#### 125th Anniversary Issue

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comment</td>
<td>2</td>
<td>The Chancellor reflects on the continuum of University purpose</td>
</tr>
<tr>
<td>Hilltop Campus</td>
<td>3</td>
<td>A lively essay on how the Hilltop campus came to be</td>
</tr>
<tr>
<td>Great Expectations</td>
<td>10</td>
<td>Freshmen arrive and a prized educational experience begins</td>
</tr>
<tr>
<td>Nerve Growth Factor</td>
<td>14</td>
<td>Scientists on the Hilltop discover a nerve growth factor</td>
</tr>
<tr>
<td>Historical Calendar</td>
<td>18</td>
<td>The benchmarks of University history in text and photographs</td>
</tr>
<tr>
<td>Oliver Lowry: Searcher in the Microworld</td>
<td>34</td>
<td>Portrait of a scientist whose work underlies much of biomedical research</td>
</tr>
<tr>
<td>The University's Founding</td>
<td>38</td>
<td>An informal look at events important to us all</td>
</tr>
<tr>
<td>Inaugural Address</td>
<td>40</td>
<td>W. G. Eliot surveys the work ahead</td>
</tr>
<tr>
<td>The Making of a Ph.D.</td>
<td>43</td>
<td>The University at a basic task —graduate education</td>
</tr>
<tr>
<td>125th Anniversary Events</td>
<td>48</td>
<td>Sampling of a celebration</td>
</tr>
</tbody>
</table>

This issue commemorates the 125th Anniversary of Washington University. To pay tribute to the vision of its founders and to reflect the contemporary University, we present in these pages articles on the University’s history and a selected group of articles from past issues of Washington University Magazine.

In the Magazine’s twenty-year history, it has reported on hundreds of fascinating activities — which took place on this campus or involved University students, faculty, and alumni. There is room here to reprise only a few. Those reprinted are intended to represent the whole—a sort of synecdoche, if you will.

Inasmuch as Herb Weitman has been the Magazine’s photographer since its inception, most of the photographs in this issue are his.

The Ed.

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COMMENT BY THE CHANCELLOR

Since the beginning, the mission of Washington University has narrowed a bit as other institutions have been created to assume or to share some of the original purposes. I am impressed, however, with the fact that William Greenleaf Eliot's words on the central motive of the University are as timely today as they were 106 years ago.

"... a perfect educator ... cherishing the individuality of every mind and adding to it the inspiration of his own. His students scarcely knew whether it was he who taught them or whether they discovered the truth for themselves."

"... the peculiar province of every university, properly so called, must always be found in the highest departments of intellectual culture."

"Its distinctive work is in the higher realms of thought ... and thus [to] enlarge the boundaries of human knowledge by discovery of new truths and by new applications of the old."

"Not quantity but quality of work is the ultimate test of a university's success."

"It is specially the part of great universities to yield as little as possible to mere popular prejudices; to maintain the necessity and sacredness of learning in times when it is generally despised or depreciated."

WASHINGTON University is much larger today. We have a magnificent campus. Our accomplishments are beyond the dreams of the early leaders. Thousands have joined in the common endeavor to make these advances possible. Our libraries are better stocked; our laboratories supplied with instrumentation of great power. In many areas we see much further and in much better perspective, not because we are inherently more intelligent or more wise but because we stand on the shoulders of those who went before. New challenges have arisen, modern problems must be analyzed and dealt with in new ways. But the central purposes of the founders continue to inspire today as they did in the 19th century.

To adapt the ancient purposes to the current time is a never-ending challenge. I believe it is now a good time for the various academic units to think through their goals and their plans for the next decade, relating each, of course, to the continuing central purposes of the University. In putting these ideas together we can better understand ourselves and better set overall goals for Washington University.
THE HILLTOP

CAMPUS

By Dorothy Brockoff

Seventy-three years ago, Washington University established its main campus on its present hilltop location just west of Forest Park. The original plan, created by the Frederick Law Olmsted firm, laid down the guidelines and provided the inspiration for the architectural development of the campus ever since. To preserve this precious architectural heritage and to continue its development is a challenge for both the University and the community.

For St. Louis the Gay Nineties was a time of fashionable town houses along Lucas Place and the erection of grand residences on private streets. These structures were elegant evidence of fortunes made through fur trade, steamboating, real estate, manufacturing, and merchandising. Unfortunately, no such grandeur characterized the cluster of buildings around Seventeenth and Washington which constituted Washington University.

The late Dean Alexander S. Langsdorf, in his meticulously detailed history of the University, sketched the seediness of this site blighted by "dusty wooden floors, numerous partitions of tongue-and-groove lumber added as afterthoughts, dark wooden trim, and lighting fixtures so inadequate by modern standards as merely to punctuate the gloom of dark winter afternoons." Having gone steadily downhill since the death of its inspired leader William Greenleaf Eliot in 1887, the University and its small band of faculty and students somehow struggled along despite ever encroaching impoverishment.

Obviously, Washington University was in need of an extraordinary leader to save it, and fortuitously such an individual materialized in the person of Robert S. Brookings, a millionaire woodenware manufacturer. Having toyed briefly with the idea of founding his own university, he ultimately abandoned this plan and decided, instead, as he himself declared, "to retire from active business and devote all of my time and practically all my estate to refounding Washington University."

Joining the University's Board of Directors in 1891, he became president of this group in 1895 and, by the end of the century, had managed to infuse new life and vigor into what had become an almost moribund institution. Spearheading a vigorous and successful fund-raising drive, he and his former business associate, Samuel Cupples, each gave his half share in the Cupples Station properties to the University, thus increasing its endowment by "several millions of dollars."

Meanwhile, the Board initiated plans to move the University farther west, and in 1894 purchased 110 of the acres on which the University now stands for an estimated $185,000.

Shortly afterwards the Boston landscape architectural firm of Olmsted, Olmsted and Eliot was employed to make a site analysis and prepare a preliminary scheme. This firm was nationally renowned for the excellence of its plans for several leading universities, including Stanford University. To those unfamiliar with Washington University's heritage, it may seem unusual that a comparatively unknown school should have looked to the very best for guidance, but such an attitude was entirely in keeping with the lofty ideals of its leaders. In his inaugural speech as Chancellor, Dr. Eliot declared forthrightly, "Our
The Hilltop Campus

The assigned task is to make for St. Louis what Harvard College is to Boston, or Yale to the city of its abode." In all probability, the great genius himself, Frederick Law Olmsted, Sr., or FLO, as his most recent biographer Laura Wood Roper calls him, did not direct the Washington University project because ill health forced his retirement in 1895, but his firm's recommendations were in the best Olmsted tradition. It is interesting to note that the Eliot involved in this work was Charles Eliot, son of a former president of Harvard, Charles W. Eliot, and uncle of a recent chancellor of this University, Thomas H. Eliot.

The Olmsted firm was impressed with the new University site and compared it with "the Acropolis of Athens, and of other Greek cities, upon which the public buildings were erected." It urged, however, that the University purchase additional land on the south side of its tract in order to permit a better balanced arrangement of buildings. It took the Board four more years to acquire some fifty additional acres at a cost of about $3,000 an acre. This action extended the southern boundary of the Hilltop campus to what is now Forsyth Boulevard.

The Olmsted firm's preliminary plan, according to Washington University's former archivist Richard Lytle, "Established the administration building in a dominant position over the park and suggested a linear development of quadrangles, with the long axis of the campus running perpendicular to Skinker Road." Delighted with the projected image, the Board in 1899 instructed the Olmsted organization to prepare a program for an invitational competition.

This competition, which required each entrant to design both a master plan and certain specific buildings, was won by the Philadelphia firm of Cope and Stewardson, which edged out five other competitors, including some of the best architectural talent in this country. Of their plan, Professor Buford Pickens, the University's eminent architectural historian, has commented: "It was architectural genius that based the plan of spaces and buildings upon the medieval courtyard tradition of Oxford and Cambridge Colleges, a tradition that has evolved successfully from the fortress-like gateway tower (Brookings) to the open round-arch, Renaissance loggia (Ridgley). The human scale, the dominant horizontality, the physical joining of one building unit to another, and the combination of a formal axis with varied informal spaces established a heritage of planning principles which could maintain unity without endless duplication of frozen forms."

This visionary plan was actually the work of Walter Cope (his partner John Stewardson had died unexpectedly in 1896), and it was he who personally spelled out his aims in an eighteen-page brief which he read to the Board as its members viewed his competition drawings. Cope based his design on a predominant style which he called "Academic Gothic." He proposed to use it within a block plan which provided for courts or quadrangles which he visualized as "outdoor rooms with the sky for a ceiling." These ideas were based on experience which the Cope and Stewardson firm had acquired in designing academic buildings on a variety of campuses, including Bryn Mawr, the University of Pennsylvania, and Princeton.

To many St. Louisans, the whole idea of building a University beyond Forest Park in an area which was then nearly all farmland and sylvan forests must have seemed complete folly. Bounded on the east by a yellow clay artery called Skinker Road, which rained, this tract must have seemed remote and impractical to skeptics of the day. But to those, including the Washington University directors, who were canny enough to understand the logistics of St. Louis at the time, it made perfect sense. For as urban historian Glen Holt has pointed out, the University's leaders were moving in the vanguard of key churches and farsighted individuals who sensed that the northwest corridor of the city was the main growth corridor. By putting the University just off the center of this primary growth corridor and protecting its acreage by Forest Park, these sagacious men secured a prime location for the University.

Professor Holt believes that they were also influenced by the fact that this key acreage was situated on a primary streetcar line and not far from the narrow gauge suburban line. Thus, convenient transportation was available. With these factors in mind, the directors must have reasoned that the new location was ideal—far enough away from the city's bustle and yet close enough to enable the University community to enjoy its amenities and to serve its needs.

For despite the fact that most of their newly acquired property lay beyond the city limits, the University's directors had no intention of severing the strong ties which for decades had bound town and gown. Charles Nagel, in reminiscing about the largesse of key St. Louisans in response to Brookings' call for financial support, declared, "It was not like ordinary giving. It was a movement. We were all working together, building for the future of St. Louis and the Southwest; a common movement to which we were contributing. There were no strings to the gifts."

In its formative years, satellite educational institutions, including the O'Fallon Polytechnic Institute, Smith Academy, Mary Institute and the Manual Training School (all secondary schools), were connected with the University, and those facilities provided much needed instruction for many of the city's young people. Some of the University's faculty,
in addition to teaching, contributed to important civic projects. William Chauvenet (Chancellor from 1862-69) was responsible for many of the mathematical calculations involved in building Eads Bridge, and engineering professor Calvin Woodward wrote a definitive book about the structure. Even the University's meager facilities and equipment were pressed into service. By 1877, its observatory was doing work for both students and the faculty, according to William Greenleaf Eliot's biographer. She recounts that its electric clock for some years "regulated not only the time for the city but for several railroad systems."

While the first five University buildings—Busch Hall, University Hall (renamed Brookings Hall in 1928), Cupples I and II, and the original Liggett Hall—were being erected in 1900-01 with funds contributed by generous donors, including another $200,000 gift from Mr. Brookings, the directors saw a chance to take advantage of an unprecedented opportunity. Aware of the fact that the city fathers were making plans to hold the Louisiana Purchase Exposition (St. Louis World's Fair) in the western half of Forest Park and adjacent acreage, Mr. Brookings seized the opportunity to lease these buildings and the new campus to the Fair management for $750,000. With the proceeds, Washington University was able to construct Francis Gymnasium, the adjoining Francis Field facilities, and Tower Hall, later renamed Lee Hall. Eads Hall, which went up at the same time, was made possible by a generous gift from Mrs. Eliza A. How, daughter of the famed engineer, James Buchanan Eads.

By the time the Fair opened on April 30, 1904, these buildings formed an attractive architectural core, but the surrounding campus was barren. Perhaps the euphoria of the Exposition and the enormous quantities of sparkling champagne uncorked in Brookings 202, the barroom, made many Fair visitors oblivious to the bleakness, but it did not go unnoticed among the University community, who stood impatiently waiting in the wings for what Henry Adams called "this marvelous phantasm" to close in December.

Nothing could be done about the barren grounds when the University community was finally able to move into its new quarters on January 30, 1905, but come April, Dean Woodward, nostalgic for the Harvard elms, proclaimed an Arbor Day. Many of the saplings planted then are the sturdy elms, maples, and pin oaks which canopy the campus walks today.

They were planted on a surface which had been laboriously changed from a place of natural farm field slopes to the shape seen today. A million cubic yards of earth were moved during the grading
operation as a twelve-foot fill on the Quadrangle, and a 30-foot fill at the Lee and Liggett sites raised these places to their present levels. A calamity was narrowly averted when precious topsoil was rescued from well-meaning, but uninformed volunteers, who had begun filling sandbags at the project to help stem the “June Rise” of the Missouri in '02. Later, much of this same soil was lost when World's Fair gardeners scooped it up to make flower beds. As a result, Dean Langsdorf reported, “The campus clay and hardpan had to be nursed for years thereafter by sowing oats and beans until grass would grow.”

Another controversy over building materials was settled when the University's entire Board trooped to the Vandeventer Avenue headquarters of the Pickel Stone Company to choose from several mock-up walls. Missouri red granite nosed out brick. The “laying up” of the granite walls required special knowledge, and the stone masons on the job were given cards with ten specific instructions. Jamieson reports that “these rules were, of course, soon known as the Ten Commandments and were quite as frequently broken as the Biblical originals.” Many of these seasoned craftsmen became even more disenchanted when a young member of the architectural firm appeared on the site in a white shirt to direct their endeavors, and a few actually quit.

Despite all of these irritations, however, the work progressed on schedule and the buildings which were created are a tribute to the creative genius of Cope and the labors of all who toiled so faithfully on the project.

Professor Pickens said recently that he believed no other college or university in the nation could boast of having eleven buildings designed by the same architect. “It was,” he concluded, “an auspicious beginning.”

Unfortunately, Walter Cope did not live to see the last of his buildings completed in 1907. He had died five years earlier of a heart attack brought on, Professor Pickens suspects, by overwork. The task also exhausted its builders and, as Professor Robert Vickery, a former campus planner and now on the faculty of the University
The Hilltop Campus

of Virginia, has pointed out: “Not until 1922, when Duncker and January Halls were started, did construction begin again, and these were the last buildings to follow the 1899 scheme.” Over the years “Academic Gothic” has been succeeded by a variety of eclectic styles, but Constantine E. Michaelides, Dean of the School of Architecture and chairman of the campus planning committee, stressed that certain key principles of the Cope and Stewardson plan have been retained.

The University on its east-west axis has continued to construct buildings which have been deliberately designed to appear only a few stories tall because of recessed roofs. One of the most imaginative and critically acclaimed buildings on the campus, Olin Library, programmed by Professor Pickens, himself a campus planner at the time, is a case in point. To keep it in scale, its designers, Murphy and Mackey, winners of another University-sponsored invitational architecture competition, sank two of its levels underground.

Cope and Stewardson tradition accounts for the continuity in the growth of the campus, Dean Michaelides continued. The principle of constructing long and narrow buildings which enclose open spaces has been retained throughout recent campus expansion. The plaza between the Seeley G. Mudd Law Building and Thomas H. Eliot Hall, Millstone Plaza between Bryan Hall and the George F. McMillen Laboratory, and Bowles Plaza, the attractive courtyard between Mallinckrodt Center and Karl D. Umrath Hall, are charming oases which reflect the quadrangle theme.

Dean Michaelides and Professor Pickens both emphasized also that Cope’s plan prevented vehicular traffic in the heart of the campus. This feature turned out to be providential when the automobile came into common usage. Service areas have been placed on the edges of the Hilltop campus, making it possible to stroll from one end to the other without ever crossing a street. Moreover, stately columns of trees have continued to be planted to arch the pathways.

Finally, Dean Michaelides called attention to what he considers an important contemporary contribution to Cope’s basic plan: the separation of academic and residential buildings. Beginning in the 1950’s, the dormitories were separated from the rest of the campus and moved to a tract called the South Forty just off Wydown Boulevard. This expansion was necessary because of the University’s decision to make an extensive effort to recruit students throughout the country and from abroad. Identified now as the residence area, this sixteen-building complex is linked to the Hill itself by an underpass beneath Forsyth. These buildings are a symbol of the truly international character of the student body.

The end result is a picture postcard campus with quaintly old-fashioned buildings juxtaposed against sleek structures of the seventies in an integrated whole which is entrancing to behold and a delight to encounter at an urban university.

Of all of the forty-nine buildings constructed during the past seventeen years, undoubtedly Mallinckrodt Center is the most used by students, faculty, staff, and alumni as well as the
million dollars, the center is part of the $63,133,261 total investment which the University has made in new buildings during the period 1957-1974.

This new construction has complemented an extensive program of renovation. Work commenced in earnest in the early sixties with the conversion of two dormitories, McMillen Hall and Liggett (now Prince), into academic structures. About the same time, Lee Hall was transformed into Karl D. Umrath Hall, a center for services and student offices. The name of John F. Lee was transferred to one of the new residence halls in the South Forty.

Over the passing years, renovation has become one of the top priorities at the University, with the result that the list of projects completed is too long to enumerate. Most of the remodeling has involved altering the interiors of buildings to meet changing academic needs and the necessity for more classroom and office space. Dunrath Hall, long the headquarters for the School of Business and Public Administration, is now the home of the English department. Business has moved to Prince. Cupples I shelters the mathematics department. Brookings Hall has been extensively remodeled to accommodate the central administration and supporting staff.

Renovation of older buildings is not easy, but it is worthwhile. Remodeling costs are approximately one-third to one-half the cost of erecting new facilities. Major renovation projects often require that workmen gut the building. Antiquated steam pipes, old electric wiring, and gas lines are either replaced or relocated. Walls are sometimes waterproofed and old floors ripped out.

One of the most popular of recently renovated facilities is the former Ridgley Library's main reading room which was converted into a commons called Mary Brooks Holmes Lounge. The scene of a gala West Point cadet ball during World's Fair days, it is now a comfortable, spacious place which serves a dual purpose. It is used to chat with friends over a cup of coffee served in a real china cup and as an informal extension of the classroom where students and faculty meet to exchange ideas. Professor Pickens believes that this commodious lounge is perhaps the best example of English Georgian architecture in the Midwest. The hand-carved oak in the room and the elegant fireplace give it a gracious warmth which is difficult to duplicate in modern buildings.

Old grads who were used to the formality of the Ridgley reading room are often brought up short by the casualness and conversational buzz in the lounge. Once they shed a nostalgic tear or two, however, their longing for the good old days disappears and is replaced by pleasure and delight with a lounge which is as distinctive as the University itself.

Meanwhile, the University continues to seek new ways to improve the campus environment. A grant from the St. Louis Regional Planning and Construction Foundation has financed several studies, including one to improve the exterior lighting on campus. Out of it developed a pilot project devised by Hellmuth, Obata & Kassabaum, Inc. Nearing completion as this article was being prepared, the aim of this trial project is to improve visibility at night without turning the campus into something resembling a department store parking lot.

Over the past seventy years Washington University has become a nationally recognized center for education and research and has undergone significant architectural growth. During the same period the St. Louis area community, which has contributed generously to the University's development, has itself undergone dramatic changes. New residential, commercial, and industrial centers have shifted westward. The University now finds itself at the heart of a resurgence of metropolitan change.

Fortunately, however, there are architectural landmarks which do not change in the community—the famous stone lions proudly guard the gateway to University City and the venerable Hanley House lends character to Clayton. At Washington University the majestic view of the city is still framed by the Brookings arch, and the gargoyles watch over a campus cherished for its beauty.
The freshmen who arrived at Washington University in fall 1969 carried with them the same mixed baggage of high hopes and shining ideals that accompanied their predecessors countless autumns before them. At Washington University they found a challenging academic atmosphere that values the undergraduate years as a cornerstone of education. Despite the distractions of their political era, they joined some 3000 other undergraduate students in serious study and emerged in 1973 older and wiser.

That year Jack Hexter (then Yale professor of history and now, once again, Washington University professor of history) addressed graduates at Eliot Honors Convocation:

“What did you want when you first came to the university at age eighteen still wet behind the ears? Many things, no doubt, and I want to consider a few of them. I would suggest that first, you sought complete freedom; second, you sought to find yourself; third, you sought the unqualified, approving love and attention that your parents, being responsible people, withheld from you. . . . The university and the faculty that is the heart of the university are institutionally organized to frustrate and alter adolescent expectations . . . to supervise the rites of passage from adolescence to adulthood. . . . If a university performs the ritual function properly, it increases the chance that those it has in its charge will be ready to face the trying, rough course of life with the resources of energy and sense and endurance and patience and self-respect that they will need day in, day out over the long pull.”
Since Robert Bookings's 1909 decision to reorganize and revitalize the University's School of Medicine, Washington University has won an international reputation for outstanding research in medicine and the biomedical sciences. This endeavor is jointly pursued on the Hilltop and Medical campuses, a fact made official in 1973 by the establishment of the Division of Biology and Biomedical Sciences, which spans the separation. Although the work of Dr. Rita Levi-Montalcini and her colleagues here in isolating nerve growth factor was first recognized in the late 1950's, it represents the continuing contribution to scientific advancement occurring within Washington University daily.
NERVE GROWTH FACTOR

By Roger Signor

Dr. Rita Levi-Montalcini is a professor of zoology at Washington University, where she teaches advanced neurology and other related graduate courses. She is also an active research scientist who divides her time between the University’s laboratories and the Italian National Institute for All Research in Rome.

Working with Dr. Viktor Hamburger and Dr. Stanley Cohen, she has made one of the most significant discoveries in recent neurological research: the isolation of a protein particle with the ability to produce dramatic growth in sympathetic nerve cells. This substance, known as the nerve growth factor, or NGF, has opened whole new areas of research throughout the world. In fact, so many biological and clinical experiments have resulted from this discovery that a large pharmaceutical firm is now preparing NGF on a commercial basis.

This nerve growth factor does what its name implies: it increases the size of sympathetic nerve cells which control constriction of blood vessels, gland secretion, heart beat, and other involuntary visceral functions. No other substance is known to evoke such a specific and profound growth effect on cells of any type. In fact, NGF plays a role in the life of the sympathetic nerve cells which has no parallel in such other growth regulators as nutrients, vitamins, or hormones.

When introduced into newborn mice and chickens, NGF seeks out the sympathetic system and causes nerve cell agglomerates, called ganglia, to grow from four to six times their normal size. It also brings about a considerable increase in the size of adult nerve cells, but does not increase their number. The exceptional growth occurs after the basic formation, or differentiation, of the sympathetic system has begun.

The magnitude of the reaction, coupled with other observations, shows that NGF is basic to the life processes of the sympathetic nerve cells of higher vertebrates. A broader role has been indicated with the detection of NGF in man and a variety of mammals. Of even greater interest are biological implications raised by recent evidence that NGF may be one of several protein growth factors which might produce a selective growth effect on a number of cell types. The possibility that other growth factors might have the same potent growth-producing effects as NGF stimulates the imagination of both scientists and laymen.

A prominent researcher became so enthusiastic over these profound implications that he asked Dr. Levi-Montalcini: “Do you realize what you may have started here?”

She admitted that speculation could be rather awesome, but reiterated that multiple-growth factors are still a “working hypothesis,” and the search for new factors will be exceedingly complex.

Dr. Levi-Montalcini’s cautious scientific approach veils a rich imagination. Her appearance—petite features and softly expressive eyes—disguises her strong determination and energy. She will not give up until she has examined a hunch thoroughly and she refuses to be distracted when once absorbed in a line of research or in guiding a student through a complex experiment.

In her native Italy during the late 1930’s Dr. Levi-Montalcini was confronted with vicious political action which easily could have discouraged other less determined individuals. She had received her medical degree and graduate training in medicine and neuropsychiatry at the University of Turin when the Fascist party of Italy became closely associated with the Nazi regime. Mussolini issued racial decrees which prevented those of Jewish background from practicing medicine and made it impossible for them to be associated with universities. She changed from clinical to basic neurological research, setting up laboratory equipment in her room at home, keeping up her scientific reading, and becoming more and more interested in pure research. Following the liberation of Italy by the Allied forces, she served as a physician with the U. S. Army in Florence, but soon began to devote full time to research at the University of Turin.

After the war, Dr. Hamburger, chairman of Washington University’s zoology department, read reports of her experiments. In 1947, he invited her to join the University as a research associate. In 1958, she was appointed a full professor.

After arriving at the University, her imagination again provided the spark which led to the exciting search for NGF. “This whole project is similar to a detective story. We’ve been able to follow up important leads in other fields and we’ve had our share of good luck to speed up our work,” Dr. Levi-Montalcini states.

The initial search for NGF was begun with Dr. Hamburger. Dr. Levi-Montalcini had been doing general neurological research when she read a report published in 1948 by Dr. Elmer M. Bueker, then a graduate student in Dr. Hamburger’s laboratory and now professor of anatomy at the New York University School of Dentistry. Dr. Bueker was interested in studying the effect of rapidly expanding tissue on sensory and motor nerve cells. He had transplanted a fragment of the malignant tumor mouse sarcoma in chick embryos. In his paper, Dr. Bueker reported that the transplant resulted in enlargement of adjacent sensory ganglia. His explanation was that the growth was due to the fact that the expanding tumor provided a larger peripheral field for the growing nerve fibers.

Dr. Levi-Montalcini did not accept this conclusion. On the surface, the author’s explanation of the unexpected growth seemed to fit neatly within a logical framework based on past experiments. Dr. Levi-Montalcini’s training in embryology and neurology helped her understand the more subtle implications of the experiment; her imagination spurred her to conduct a reinvestigation.
She devised a detailed series of tests in which she implanted mouse sarcoma into chick embryos. The tumor tissue was placed in direct contact with the embryonic tissue. At varying intervals of days after the tumor implantation, sections of embryonic tissues and tumor were observed under the microscope. The results were startling. The sympathetic nerve ganglia had grown as much as six times normal size. Viscera, which are not normally innervated until the end of the incubation period, were massively invaded by sympathetic nerve fibers.

Now that the effect of the tumor had been carefully explored and found to be of an exceptional magnitude, she placed the sarcoma tissue on an outer membrane of the fertilized egg and obtained the same result. "Since the tumor and the embryo tissues were not in direct contact, but merely shared a common circulation, we decided that a growth factor was being released by the tumor cells," she concluded.

To verify these findings further, Dr. Levi-Montalcini developed a tissue culture technique which obviated the relatively slow method of implanting tumor tissue into living chick embryos. In the new method, a tumor fragment and nerve ganglion were placed in close proximity in a cultural medium of chicken plasma and embryonic fluid; this yielded the same dramatic outgrowth of nerve fibers from the ganglion. This technique is now virtually a standard method for testing tissue for growth factors in experiments being conducted in various laboratories.

After the tissue culture technique was perfected, the NGF was extracted from the tumors and Dr. Cohen conducted the detailed analysis which identified the substance as a protein particle. The presence and identity of the factor had now been established through normal channels of deduction: The snake gland and mouse salivary are homologous; also, mouse tissue had exhibited a mild nerve growth effect in previous tests. Accordingly, Dr. Cohen tested the salivary glands of male, adult mice and found that they were an even greater source of NGF than the venom glands or mouse sarcoma.

This led to tests of other animal salivary glands, but no significant concentrations of NGF were detected. Subsequent investigation of different tissues did reveal the important fact, however, that NGF is present in a large number of embryonic and adult tissues of all species, and in the blood serum of mammals, including man. Human ganglia taken from abortive embryos react to the NGF in the same way as the ganglia of chick embryos or other vertebrates. Additional proof of the importance of NGF in animal organisms was established with the development of an antiserum or "antiprotein" to NGF.

Dr. Cohen produced the antiserum by injecting NGF into rabbits. When this "antiprotein" was injected into newborn mice, from 95 to 87 per cent of the sympathetic nerve cells immediately disintegrated and disappeared. This effect gave strong supportive evidence to the primary role played by NGF in the development and maintenance of the sympathetic system. The antiserum also made it possible to raise laboratory animals without sympathetic nervous systems. Since the antiserum did not affect any other organs, the animals appear to be normal in all other respects. Hundreds of these animals have been raised to an adult age at Washington University and other universities for research on the function of the sympathetic nervous system. The possibility of a clinical application in the near future cannot be ruled out as overaction of the sympathetic nervous system is thought to play a role in hypertension and other ailments in man.

The functional significance of NGF, says Dr. Levi-Montalcini, "in the growth and developmental processes of the sympathetic nerve cells can hardly be questioned. We have evidence that in the mouse the sympathetic cells remain receptive to NGF throughout life, and it is conceivable—but still not proved—that this applies also to the same cells in other mammals."

So far the origin of NGF has not been determined. Dr. Levi-Montalcini states that various pieces of evidence indicate that the mouse and snake glands may be only storage systems for NGF. As pointed out, the snake venom glands and mouse salivary glands contained large amounts of NGF, but the factor was not detected in the salivary glands of other species. Finding the primary source of NGF would be a breakthrough in the research project. It might also provide new leads in the search for additional growth factors.

The latter possibility is a fascinating hypothesis. New evidence in support of the existence of a family of protein growth factors was advanced a year ago by Dr. Cohen, who isolated another protein particle in the mouse salivary gland. It has been
Early in their work on NGF, Dr. Levi-Montalcini and her colleagues found the salivary glands of adult male mice an important source of NGF.

established that the protein evokes striking growth in skin cells when it is supplied to growing or adult mice. If further growth factors are to be found, it is conceivable that they might produce selective and dramatic growth for different cell lines forming the central nervous system, which includes the brain, or for the heart, lungs, kidneys, or other organs.

The excitingly broadened and intense search by Dr. Levi-Montalcini and her associates is continuing in Rome, where she has a laboratory in the Italian National Institute under joint sponsorship of the Italian government and the U. S. National Institutes of Health. By working in Rome from July to January each year, Dr. Levi-Montalcini can be close to her family and at the same time collaborate with Italian and American scientists who are interested in the same research problem. Although Dr. Cohen left Washington University in 1959 to accept a position at Vanderbilt University, he joined Dr. Levi-Montalcini at the Rome laboratory this summer. They were reunited with another former Washington University associate, Dr. Pietro Angeletti, an Italian physician and biologist who is co-director of the laboratory.

While in Italy, Dr. Levi-Montalcini is also reunited with her twin sister, Paola, who has achieved wide recognition in that country for putting her imagination to work in a field unrelated to science. Paola Levi-Montalcini has created many richly imaginative abstract oil paintings. "Possibly, she is the best woman artist in Italy," proudly announces Dr. Levi-Montalcini, who owns several of Paola's works, which are prominently displayed in her apartment in St. Louis.

Dr. Levi-Montalcini can always be counted on to avoid discussing herself; she continually praises the abilities of her sister or respected colleagues such as Dr. Cohen and Dr. Angeletti. Last spring, however, she had to step into the limelight to accept a singular distinction. She was chosen as the first woman scientist to receive the highly regarded Max Weinstein Award, given by the United Cerebral Palsy Association for outstanding contributions in neurological research. The award carried with it a sizeable monetary prize which Dr. Levi-Montalcini gave to a charitable cause. The awards committee cited Dr. Levi-Montalcini for her "most imaginative studies in neuroembryology, in which she was able specifically and selectively to grow parts of the nervous system...."

It was apparent to the committee that aside from the many scientific skills involved in the NGF research, imagination was a key force in Dr. Levi-Montalcini's work. It is a factor that may well lead to greater discoveries.
For the convenience of teachers and students, the first law classes were in the University's Polytechnic Institute at Seventh Street and Chestnut Avenue.

Academic Hall (left), on 17th Street between St. Charles and Washington Avenues, was the first home of Washington University. By this time, the original structure had become a wing of a much larger building fronting on Washington Avenue. Circa 1880.

St. Louis Medical College at 1806 Lucas Place first housed the School of Medicine. Dental School headquarters were next door at 1814 Lucas Place.
HISTORICAL CALENDAR

1853

Washington University is founded.

"It is—the beginning of a great work, capable of indefinite extension, but each step in its progress, and the first step in its commencement, involve sacrifice both of time and money ... We desire to lay the foundation, and to mature some parts of the plan. Those who come after us must finish the work."

William Greenleaf Eliot
First address to the University Board
February 22, 1854

1857

The School of Engineering begins as the Scientific Department of the University and, a decade later, becomes a separate school. Its graduate division, the Sever Institute of Technology, is founded in 1948.

1859

Joseph G. Hoyt, a Yale graduate and classical scholar, is named Chancellor (serving until 1862) to assume the responsibility for the University's academic affairs.

"The institution which he found an academy, he left a university. Probably no man will ever again in its history effect so wide a change."

Professor Sylvester Waterhouse
In eulogy of Chancellor Hoyt
January 20, 1863

1862

William Chauvenet is elected the second Chancellor (serving until 1869). His appointment in 1859 as Professor of Mathematics and Natural Philosophy was made by Chancellor Hoyt.

A graduate of Yale University and an eminent mathematician, Chauvenet was appointed professor of mathematics by the U.S. Navy and in 1842 took charge of its shore school in Philadelphia. His reforms of that system and recommendations for its reorganization were largely responsible for the establishment of the U.S. Naval Academy at Annapolis. He served at that Academy as professor of mathematics and astronomy and was, according to a fellow scientist 'the most prominent member of the academic staff.' The same biographer relates that Chauvenet chose to come to Washington University in 1859 despite an offer of a professorship at Yale University, probably because of his lifelong friendship with Yale classmate Joseph Hoyt.

Alexander S. Langsdorf
"History of Washington University," 1953, an unpublished manuscript

1867

The School of Law is founded.

"The Law School began with a distinguished faculty, with Henry Hitchcock, a leading member of the bar, as dean, and other professors, including Hon. Samuel Treat, U.S. Judge for the Eastern District of Missouri (who had been one of the judges in the Dred Scott case); Hon. Nathaniel Holmes, Justice of the Supreme Court of Missouri; Hon. John D. S. Dryden, late Chief Justice of the Missouri Supreme Court; Albert Todd, a prominent member of the bar; and Alexander Martin, assistant professor, as assistant to Judge Treat."

Alexander S. Langsdorf
"History of Washington University," 1953

1869

Washington University becomes the first American University to admit women as students of law. In 1872, the College accepts its first woman. By 1880, the presence of women students is a routine matter.

1870

William Greenleaf Eliot is elected Chancellor (serving until 1887) while continuing to serve as President of the Corporation, thus assuming the full academic, as well as financial, responsibility for the institution he had fathered.

1879

The School of Fine Arts is founded. Although design had been taught as early as 1867 and a decade later an Art Department...
Historical Calendar

Robert Somers Brookings, Chairman of the University Board 1895-1928

Adolphus Busch, Benefactor and University Trustee 1895-1913

Winfield Scott Chaplin, Chancellor 1891-1907

Samuel Cupples, Benefactor and University Trustee 1881-1912

Class photo, Missouri Medical College. In 1891 it became a part of the School of Medicine of Washington University.
existed, the board formally establishes a school in anticipation of the gift of a building from University co-founder Wayman Crow. The building to house the school and a St. Louis Art Museum is dedicated in 1881.

"So far as my knowledge extends, this is the first university in the United States that has established a School of Fine Arts as a full department in equal rank with the rest."

William G. Eliot
Letter of 1882

1891

Winfield S. Chaplin is elected the fourth Chancellor (serving until 1907). Chaplin, an engineer who had graduated from West Point, came to the University in 1886 from the deanship of Harvard's Scientific School.

"Few men have seen such a large part of their vision fulfilled as I have, and no man has greater faith than I have that the remainder will in due time be realized. I hope that Washington University will continue to be, what it has always been—the product of the intelligence and generosity of the citizens of St. Louis."

Winfield Chaplin
At the 50th anniversary of the University's founding, 1907

1892

The Missouri Dental College, established in 1866 by the Missouri State Dental Association, joins the University. The Washington University School of Dental Medicine is the first dental school established by organized dentistry, the first formed in association with a medical school, and the first founded on a nonprofit basis.

1898

The Graduate School of Arts and Sciences begins with the establishment of a faculty committee on the advanced degree program, although students had been pursuing advanced study since 1862. That year, three members of the first graduating class of the University continued as postgraduate students. They received master of arts degrees in 1866.

1902

The School of Architecture begins as a department of the School of Engineering. In 1910 extensive changes in that program established architecture as a school in its own right.

1904

The first Olympic Games in America are held on the University's Francis Field.

"More than nine thousand athletes participated in the contests and exhibitions during the St. Louis Olympics, which ran from August 19 to September 3. There were thirty-eight separate athletic contests that corresponded roughly to present-day Olympic competition, but there were dozens of other events never seen before or since at the Olympic Games, ancient or modern. Entry rules were flexible, regulations uncertain, and the
The 1904 Olympics, held at Francis Field, were among the attractions of the Louisiana Purchase Exhibit (World's Fair).

Tree planting days became a tradition after the University moved to its vegetation-barren campus. Today's majestic oaks are among the legacy of that era.

Construction of the buildings on the main Quadrangle was begun in 1900 and 1901. These were completed by 1903 and leased to the World's Fair.
World's Fair surroundings gave the affair a carnival atmosphere. "Despite these handicaps, many first-rate performances were recorded in the standard events. Foreign nations represented at the Games included Greece, Germany, Ireland, Canada, Australia, Hungary, South Africa, and Cuba. Neither Britain nor France sent official delegations, but many Englishmen and Frenchmen competed under various banners. As they had at the two earlier [modern] Olympiads, the Americans ran off with most of the honors in the track and field events. There was little Archie Hahn, the Milwaukee Meteor, who won the 60-, 100-, and 200-meter dashes; Ray Ewry of the New York Athletic Club, who took three wins in the standing jump events; and Harry Hillman of the New York Athletic Club, who ran off with first place in the 200- and 400-meter hurdles and the 400-meter flat race. Another triple winner was the aptly named James Lightbody of the Chicago Athletic Club, who won the 800-, 1500-, and 2500-meter events.

"An awesome contest was the battle between two giant guardians of the law, Etienne Desmarteau, the gendarme from Montreal, and John J. Flanagan, one of 'New York's Finest.' Desmarteau won the 56-pound weight toss and Flanagan took the shotput title with a world's record heave of 48 feet, 7 inches."

"Olympics at Francis Field"
by Frank O'Brien
Editor, Washington University Magazine, Summer 1967

1905
Washington University moves from its downtown location to its new Hilltop campus at Skinker Boulevard and Lindell Road.

1908
David F. Houston, former president of the University of Texas, becomes the fifth Chancellor of Washington University. Although his tenure as Chancellor extended nominally until 1917, in March 1913, he was given an indefinite leave of absence to accept an appointment as Secretary of Agriculture in the cabinet of his friend, President Woodrow Wilson. He later also serves as Secretary of the Treasury.

"The reorganized Medical School, the greatly enlarged libraries, the additional equipment in laboratories, the growth of the student body, and probably most important, the rather exceptional group of men now constituting the Corps of Instruction, all bear witness to his (Chancellor Houston's) able leadership."

Resolution of the Board of Washington University
1917
1908
University College begins as Saturday classes. It adds evening classes in 1915 and is given degree-granting powers in 1931.

1910
The University's School of Medicine is reorganized. It becomes one of the first schools to establish full-time professorships—in internal medicine, surgery, and pediatrics.

"The spark which fired what may be regarded as the explosive attainment of genuine preeminence by the Medical School was the survey of medical education made in 1909 by Abraham Flexner for the Carnegie Foundation for the Advancement of Teaching. The results of this investigation, published in 1910 as the famous Bulletin Number Four, entitled 'Medical Education in the United States and Canada,' created a national sensation and initiated major reforms throughout the whole field of medical education.

"But before the appearance of the printed bulletin, Flexner had reported privately to Henry S. Pritchett, then President of the Carnegie Foundation, that so far as the Medical School of Washington University was concerned, one of two alternatives must be adopted: the department must be abolished or reorganized. Pritchett, whose sixteen years as Professor of Mathematics and Astronomy at Washington University had established close ties with the men in charge of its affairs, immediately mailed a copy to Mr. Brookings. He was so shocked by Flexner's dictum that he lost no time in going to New York to see Flexner.

"The upshot was that Flexner returned to St. Louis with Mr. Brookings, and after a two-hour inspection, the latter was convinced that something had to be done . . . Robert S. Brookings accepted the challenge and, with the energy and vision which characterized all his enterprises, made the dream (of a model medical school) a reality.

"There is reason to believe that Flexner's preliminary report was deliberately designed to provoke the very action that ensued, for Mr. Flexner saw the opportunity presented in St. Louis for the creation of a 'Johns Hopkins of the West.' At all events, the Carnegie report as finally issued stated, 'Washington University is . . . at this writing marked out as the natural patron of medical education in Missouri. Its importance is bound to be more than local. Aside from its obvious possibilities as a productive scientific center, Washington University Magazine
One of the informal historians of the early years of Washington University's Hilltop Campus was the late Arthur Proetz, AB 10, MD 12. An avid amateur photographer, Proetz captured the spirit of the period. In 1913 he photographed a commencement on the Quadrangle under a tent. Women and men graduates entered in separate processions.
University must be the main factor in the training of physicians for the southwest country; the city of St. Louis has in this section an even clearer opportunity than has Chicago in the Middle West, New York in the East, or Boston in New England. For there is no other large city south of Minneapolis, or as far as the Pacific, which as completely meets all the requirements of the case. There is abundant evidence to indicate that those interested in Washington University appreciate its manifest destiny; it bids fair shortly to possess faculty, laboratories, and hospital conforming in every respect to ideal standards . . .

Alexander S. Langsdorf
"The History of Washington University," 1953

1913

Frederic A. Hall becomes the sixth Chancellor (serving until 1923). Dr. Hall had come to the University in 1901 as Collier Professor of Greek. He had been acting chancellor during the years in which Chancellor Houston served as a member of Wilson’s cabinet.

“The period of his chancellorship, from 1913 to 1923, was one peculiarly filled with problems and complications. The coming of the World War marked important changes. After the war, the rapid expansion also exhibited in excellent light his peculiarly adaptable qualities of administration. His work has been felt and appreciated not only by the students, alumni, and faculty, but also by the people of St. Louis and of the state, to whom, as might well be said, he first made the University a vital factor.”

George R. Throop
March 1925

“There is not the least doubt in the minds of men now living that of all men who have held the office of chancellor none has been more greatly beloved than Frederic Hall.”

Alexander S. Langsdorf
“History of Washington University”
1953

1917

The School of Business and Public Administration begins as the School of Commerce and Finance. It is renamed in 1926.

“What happened (at Washington University) in 1923—the establishment of the Graduate School of Economics and Government under the leadership of Robert S. Brookings—ultimately led the school into public administration . . .
“Brookings wanted the graduate school to train students for doctoral degrees in economics and government. They would spend two years at Washington University and the third in Washington, D.C. . . . When a lawyer pointed out that as a Missouri corporation the University could not operate outside the state and retain its tax exemption, the Brookings Institution was divorced from the University. But a course had been set.

“Its direction became evident in 1925 when the University named a new dean of the Business School. He was Isidor Loeb, acting president of the University of Missouri. He was also a foremost constitutional lawyer, a skilled political scientist who knew politics from the inside and the outside, an expert on tax laws and Missouri history, a good card player with a quick sense of humor, and an articulate spokesman for social and economic reform.

“Dean Loeb retained the broad base of the business school, and he liked to think of administration as a common art that could be applied to organizations as varied as hospitals and government.”

“Fifty Years in Business”
by George Monaghan
Washington University Magazine, Summer 1967

1922

Arthur H. Compton, performing experiments in Eads Hall on the Hilltop campus, makes the first observations of the increase in X-ray wave lengths, the phenomenon that later came to be known as the “Compton effect.” In 1927 he is awarded the Nobel prize in physics for this discovery. Associated with him in this are fellow Washington University physicists G. E. M. Jauncey and C. F. Hagenow.

1923

Herbert S. Hadley becomes the seventh Chancellor (serving until his death in 1927). Hadley brought with him to the University a national aura having behind him a distinguished career as a lawyer and politician. (He was Missouri’s first republican governor since the reconstruction). During his chancellorship, the University expanded in physical plant, academic structure and enrollment.

“In terms of its duration, the administration of Herbert Hadley covered a period only slightly in excess of four years, in which respect it is comparable to the correspondingly brief term of the first Chancellor, Joseph G. Hoyt; but coming as it did in the middle 1920’s, the period which is notable in national

history as an era of unprecedented and feverish prosperity, the Hadley term, notwithstanding its brevity, exhibits the crowding activity characteristic of the time. From the point of the outside community, these four years were perhaps chiefly memorable for the extensive building operations which greatly enlarged the physical plant on the main campus and at the Medical Center. . . .

“There is a close parallel between the circumstances of the final illness and death of Herbert Hadley and those that attended the closing days of the first Chancellor, Joseph G. Hoyt; both men knew clearly that death was coming, and both fought manfully to carry on to the end. But whereas Hoyt’s life ended as the blight of civil war threatened the life of the institution of his day, Hadley had the satisfaction of having witnessed a period of definite growth and progress. At the close of the academic year 1926-27, he was able to report an overall University registration of 7,895, of which 3,773 represented students in degree-conferring departments—the largest enrollment in University history up to that time; and, what was a relatively new note in University annals, that the year would end with a surplus, with every prospect that that pleasing condition would be continued in the year ahead.”

Alexander Langsdorf
“History of Washington University,” 1953

1924

The Summer School is founded.

1925

The George Warren Brown School of Social Work is begun as a chair of applied sociology held by Frank Bruno, formerly of the University of Minnesota. The following year it becomes a part of the School of Commerce and Finance. It is named George Warren Brown in 1928 and is established as a separate professional school in 1945.

“For a time during its early formative years, GWB was plagued with money problems. Then, suddenly, help came from a totally unexpected source. A half-million dollar gift from assets of the late George Warren Brown, a well-known shoe manufacturer, was made to the University by his widow in 1928 for the establishment and endowment of the George Warren Brown Department of Social Work. . . . When Mrs. Brown died six years later, she bequeathed one half of her estate to the University for a major expansion of the social work program.
**Historical Calendar**

*George Reeves Throop, Chancellor 1927-1944*

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"With its dedication in 1937, Brown Hall became, according to Chancellor Throop, 'the first building erected in this country solely for the purpose of social work education.' On that occasion Professor Bruno announced the elimination of GWB's undergraduate curriculum, and stated that henceforth GWB would focus only on a two-year graduate program. . . ."

"Golden Anniversary"
by Dorothy Brockhoff
Washington University Magazine, Spring 1976

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**1927**

George R. Throop is elected the eighth Chancellor. Throop, a classical scholar who had first joined the faculty in 1907, resigned in 1944.

"No one, least of all George Throop himself, could have foreseen at this time of surging prosperity the severe trials and tribulations that the future held in store. It was his fate to be called just on the eve of an era of distressing financial difficulty, to head a university grown far beyond the poverty-stricken little institution from which it had developed, and therefore infinitely more difficult to maintain without serious impairment. His response was exactly what would have been expected of a man who possessed the highly developed sense of duty and responsibility so characteristic of George Throop. Those who knew him well must have an ever-increasing admiration for the courage and dogged determination with which he faced his problems, never taking a vacation when troubles were at their worst, bearing the brunt of responsibilities he might well have delegated to others. He once explained his relentless and stubborn devotion to duty by saying that 'the first element of success is work, the second is work, and the third is work.' "

Alexander Langsdorf
"History of Washington University," 1953

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**1928**

With the completion of a new building for the School of Dental Medicine, the University rounds out a period of physical expansion on both the Hilltop and the Medical campuses which had begun in 1923. Ten major buildings had been erected.

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**1933**

Dr. Evarts A. Graham, professor of medicine, performs the first successful pneumonectomy, removal of the entire human lung, for the treatment of cancer. In 1942, he receives the Lister medal, regarded as the world's highest award in the field of surgery.

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**1938**

The University's Mallinckrodt Institute of Radiology builds on the Hilltop campus the first cyclotron designed to be used solely for medical purposes. For the government's wartime atomic program, this cyclotron helps produce the first usable amount of plutonium.

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**1943**

Dr. Edward A. Doisy, a former member of the faculty of the School of Medicine, receives the Nobel prize in physiology or medicine.

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**1944**

Dr. Joseph Erlanger, a member of the University's medical school faculty, and Dr. Herbert S. Gasser, a former member, win the Nobel prize for discoveries concerning the origin, nature, and transmission of nerve impulses and the mechanics of their action in tissue.

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**1945**

Arthur Holly Compton becomes the ninth Chancellor of Washington University. Compton had left Washington University in 1923 for a position at the University of Chicago, where he remained while working on the Manhattan Project to develop the atomic bomb.

"To many of the older members of the faculty he came not as a stranger but as the friend and colleague who had been Professor of Physics from 1920 to 1923, and who in that capacity had done the work which in 1927 earned for him the high distinction of the Nobel prize. To others, both inside and outside the University, he came as the bearer of an honored name known far and wide because of his own achievements and those of his distinguished brothers.

"Predilection for educational careers seems to have been an inherent trait in the Compton family, for the father had been for many years head of the department of philosophy, and for some years acting president, at the College of Wooster, in Ohio."
It was there that Arthur H. Compton was born on September 10, 1892, the youngest of three brothers, of whom the other two, Karl and Wilson, were at the time of Arthur’s appointment respectively the presidents of Massachusetts Institute of Technology and of Washington State College. After graduating from the College of Wooster in 1913, Arthur Compton pursued graduate work in physics at Princeton, leading to the degree of Ph.D. in 1916. There followed a year as instructor of physics at the University of Minnesota, two years as research engineer with the Westinghouse Lamp Company, a year as National Research Fellow at the Cavendish Laboratory at Cambridge, England.”

Alexander Langsdorf
“History of Washington University,” 1953

1947

Drs. Carl F. and Gerty T. Cori, members of the faculty of the School of Medicine, share the Nobel prize with another scientist for investigations of the cycle required to change glucose into glycogen and glycogen into glucose.

1947

In June, black students are admitted to the School of Medicine and in December to the School of Social Work. By March 1949, all other graduate divisions admit black students. A formal open-admissions policy is adopted by the board in 1952. It is interesting to note, however, that a similar admissions policy was adopted by the faculty on June 11, 1888, and that until the turn of the century black students were admitted and graduated in both undergraduate and professional programs.

1951

Washington University School of Medicine becomes the first school in the nation to adopt an international cooperative teaching program under the Marshall Plan.

1953

Dr. Evarts Graham, already considered by many to be unsurpassed among contemporary surgeons in his influence on the medical profession, reports that he and two associates have “positive evidence” that cancer can be caused by cigarette smoke tar.
Historical Calendar

1953

Ethan A. H. Shepley becomes the tenth Chancellor of Washington University. He serves until 1961.

"Somehow what he was overshadowed what he did," said Chancellor William H. Danforth of Ethan A. H. Shepley. Dr. Danforth’s remark touched the essence of Mr. Shepley’s greatness. . . . His sincere interest in each person as an individual was apparent to all who knew him. He radiated honesty; he was the antithesis of self-serving political and social smoothness.

"He had an extraordinary capacity to inspire confidence," remarked Merle Kling, Dean of the Faculty of Arts and Sciences under Mr. Shepley. "People were willing to commit themselves to him without demanding data." This trait led to an atmosphere in which Chancellor Shepley could secure decisions about the University’s future and then elicit the necessary support to carry out those decisions.

"During Mr. Shepley’s tenure as chancellor, the University’s undergraduate divisions made the transition from a local to a national student body; faculty salaries became more competitive; an outstanding library became a reality; and throughout his thoughtful and consistent leadership the University gained a national reputation among academic institutions as a place where academic freedom was reality rather than rhetoric . . . ."

"Comment"
by Roger Signor
Washington University
Magazine, Summer 1975

1954

Professor George Mylonas uncovers in Mycene, Greece, an amphora (a large decorated jar) which is ranked among the greatest discoveries of Greek antiquity.

1957

Construction is begun on a complex of dormitories which will allow the University to move from regional to a national status. Students are attracted from across the country so that by 1978, all fifty states and a number of foreign countries are represented among its entering freshmen. Approximately 20 percent of the 1978 freshmen are from the St. Louis area.

1958

The School of Medicine institutes the country’s first endowed chair in child psychiatry. It is held by Dr. James Anthony.
**1959**

Drs. Arthur Kornberg and Servo Ochoa, former members of the faculty of the School of Medicine, receive the Nobel prize in physiology or medicine.

**1960**

Olin Library is opened and is described as "the very best of the relatively new academic library buildings in the country."

**1961**

Carl Tolman, vice chancellor and dean of the faculties, becomes the eleventh Chancellor of Washington University. A geologist, Tolman had been associated with the University as a faculty member and administrator since 1927. He served until his retirement the following year.

"Carl Tolman has done a remarkable job of maintaining our momentum on the educational front."

Thomas H. Eliot
Chancellor
1962

**1962**

Thomas H. Eliot becomes the twelfth Chancellor of Washington University (serving until 1971).

"Building on the solid foundations laid by Arthur Holly Compton and Ethan Shepley, Chancellor Eliot completed the transformation of Washington University from a good, but relatively unknown institution, to a top-level national university. Under Eliot, the drive toward academic excellence begun under Compton and Shepley went into high gear; with Eliot, the University achieved national recognition commensurate with its academic standing; from Eliot, the University received the inspiration and the leadership to break new ground, to pioneer new programs, to function and grow in most difficult times.

Dean Merle Kling summed up the Eliot Era best: 'In an age of increasing bureaucracy, Eliot may be the last of the individuals who unmistakably leaves his personal stamp on an institution.'"

"Thomas H. Eliot"
by Frank O'Brien
Editor, Washington University
Magazine, Summer 1971

Olin Library, completed in 1960, is an award-winning architectural design.
Historical Calendar

Construction of the University's residence halls area, begun in 1957, was completed within a decade, bringing to Washington University an undergraduate student body of national scope.

Under Dr. Robert Walker, McDonnell Center for the Space Sciences has been internationally recognized as a setting for major interdisciplinary work in astrophysics.

Chief Justice Earl Warren addressed the audience on Founders Day 1965, kicking off the University's "Seventy by Seventy" campaign.

The University laboratory for space physics has studied extremely heavy cosmic radiation to contribute to an understanding of galactic processes. Balloons which surmount the earth's atmosphere are used to collect and bring back data.
1965
Washington University launches a major campaign to raise $70 million by 1970 "to complete the emergence of Washington University as a leading national institution." It exceeds its goal by $8 million in 1969.

1966
The Cartter Report of the American Council on Education places Washington University's graduate programs among the "top 25" of American universities, both public and private.

1969
Dr. Alfred Hershey, former member of the faculty of the School of Medicine, receives the Nobel prize in physiology or medicine.

1971
William H. Danforth becomes the thirteenth Chancellor of Washington University.

"When Dr. Danforth became chancellor of Washington University, the institution, like many others throughout the country, was emerging from an era of turbulence and dissidence... With a blend of firmness and diplomacy, Dr. Danforth helped turn that condition completely around and led the university family into a new era of harmony and cooperation..." On the campus and in the larger community, his contributions reflect his healing touch, his rare skill in bringing together those of differing viewpoints and a deep concern with improving the quality of life... "Notable among his achievements... is his leadership in the audacious reclamation project now going on around the Washington University School of Medicine in the south part of the Central West End..."

"William H. Danforth, M.D."
by Mary Kimbrough
St. Louis Globe-Democrat
January 1978

1973
The University organizes a new Division of Biology and Biomedical Sciences to promote cooperation between the biology department and the preclinical departments of the School of Medicine and successfully develops interdisciplinary academic and research programs for undergraduates, graduate, and professional students.

1975
The Center for the Study of American Business is established.

1976
The University announces its success in matching a $60 million Danforth Foundation Challenge Grant two years ahead of schedule.

1978
Washington University marks its 125th Anniversary with a month-long, varied celebration featuring noted speakers and special events.
The list of eminent research scientists who have been affiliated with Washington University's School of Medicine during the past decades is long and impressive. Of the ten Nobel laureates whose work was done totally or in part at the University, nine have received the prize in physiology and medicine (Arthur H. Compton’s prize in physics is the exception). Hundreds of others have made milestone contributions to medical knowledge. Oliver H. Lowry, chairman of the department of pharmacology from 1947 to 1976, represents their number. His basic research in biochemistry, which has made him one of the most cited authors in scientific literature, underlies research in every medical field.

OLIVER LOWRY: Searcher in the Microworld

That very serious-sounding field of science, biochemistry, is indebted to a premed student for a facetious remark that he made nearly forty years ago. “Why don’t you go into biochemistry?” he advised a young chemistry major. “You can do whatever you want and no one can prove you’re wrong.”

Biochemistry wasn’t quite that wide open. But in the 1930’s the field had considerably more elbow room than many other areas of chemistry. The advice of the irreverent premedical student was followed.

Today, the chemist, Oliver H. Lowry, is chairman of Washington University’s pharmacology department and a leader in developing and applying new chemical techniques for a better understanding of the functions, the internal workings, of life’s basic unit—the cell. It’s not surprising, though, that few people outside Dr. Lowry’s field know anything about his work. As laymen, we are the poorer for our incomplete knowledge of basic research and of biochemistry in particular. For one thing, how well these scientists are able to define and relate the thousands of elegant chemical events that are the life of the cell will have much to do with a complete understanding of most diseases.

Dr. Lowry, however, is quick to point out that he—as most honest men in basic research will admit—did not enter biochemistry with some grandiose vision of a Medical Breakthrough in mind. In his field, that would be about as realistic as entering the family’s second-hand station wagon in the Indianapolis 500.

“As an undergraduate, biochemistry did seem to me as if it held a lot of opportunities—my friend’s joke did have a point,” Dr. Lowry said. “This business of dramatic motives in basic research is overdone.” He explained that when he began his studies at the University of Chicago he learned that there was, indeed, a tremendous potential for biochemists who could come up with ways to do a seemingly ordinary task—to measure the components of cells and tissues—with greater precision. “Before then, I wasn’t really interested in measuring anything. I hated quantitative analysis in college. But when I saw what could actually be done with better quantitative methods in biology, I got very interested.”

And, as it has turned out, other biochemists have been quite interested in how Dr. Lowry has succeeded in this fundamental task. The magnitude of their interest was measured and published by the Institute for Scientific Information for the first time in 1967 as the “Citation Index.” The results were somewhat surprising and were reported as follows in the London Times: “A top-fifty chart of the world’s most eminent scientists is in the current Nature Magazine. . . . Scientific eminence is measured not in terms of how many articles you’ve written, but how many times other people have cited them in their articles. O. H. Lowry, an American scientist (who?), is well in front with 2,921 citations, and a cool 1,500 lead over number 2. Sir Neville Mott, Professor of Experimental Physics at the Cavendish Laboratory, has nothing to complain about at position 21 since he’s three steps up the ladder from Sigmund Freud, lying twenty-fourth.” (Dr. Lowry has led the Institute’s Citation Index in subsequent years as well.)

One gets an idea of “who” Dr. Lowry is from his answer to why he heads the Citation Index. “The main reason for most of the citations was a paper we did on a method for measuring protein. The paper was a kind of potboiler, stupid sort of research—one of the least original things we’ve done. The method had been around for a long time. We simply made it more accurate—and there are an awful lot of people studying protein.”

Dr. Lowry and his associates have done a number of other experiments, of course, and their reports on them are perhaps not as well cited as the protein paper. But they are nonetheless widely known and put to use throughout the field. Dr. Lowry’s gentle put-down of his place on the Citation Index brought to mind a visit to his former laboratory in the old South Building on the Medical School campus in 1966. It was just after he and Dr. Janet Passonneau had won the Borden Award, which is one of the top medical research prizes in this country. Dr. Lowry and Mrs. Passonneau (wife of Joseph Passonneau, former dean of the School of Architecture) had collaborated for several years in research on nerve cells.

When questioned about the award, Dr. Lowry gave the major credit to Mrs. Passonneau. He very quickly changed the subject by conducting a tour of his then incredibly crowded and cluttered laboratory, proudly demonstrating its countless items of microglassware and other miniature tools made and used by his staff. He patiently answered all kinds of naive questions, making his nonscientist visitors feel that they were every bit as welcome as prominent biochemists or representatives of wealthy foundations.

Since that time Dr. Lowry and the rest of his staff, ten in number, have moved with much of the medical school faculty into the new McDonnell Medical Sciences Building. On a visit this spring to these spacious and modern quarters, one might expect to find an administrator-researcher like Dr. Lowry in a plush office encircled by secretaries. He was in a far more pleasant office, to be sure; but it was small, sparsely furnished, and without a single secretary to guard the door. He was trying to finish his lunch, which he had brought to work in a paper bag, while listening attentively to a maintenance worker describing his problems in moving equipment to the new building.

There are few scientists who can conceal impatience or irritation at the average nonscientist’s ignorance of the field in question. Dr. Lowry is one of these rare gentlemen. After he had dismissed the Citation Index, he fielded desultory questions about his technical work without a wince and with gentle humor. He recalled
that after getting his Ph.D. and M.D. in 1937, he went to work in the Harvard laboratory of an outstanding biochemist and former teacher at Chicago, A. Baird Hastings (affectionately known to his students as “Acid Base” Hastings). Professor Hastings, Dr. Lowry, and several other assistants in the Harvard lab measured the distribution patterns of various salts inside and outside body cells. Later, Hastings’ clinical students applied this basic work to gain a better understanding and treatment of dehydration in their patients.

In 1939 Dr. Lowry won a fellowship to study with another distinguished researcher, the late Kaj Linderstrøm-Lang of the Carlsberg Laboratories, Copenhagen. Dr. Lowry had been dealing with minute biological entities up to that point, but working with Professor Linderstrøm-Lang he developed one important microtechnique which he and his co-workers at Washington University have refined and used ever since. At the time, standard microbalances—very refined versions of the familiar twin balance scales—were quite sensitive, but not sensitive enough to measure the small clusters of cells that Dr. Lowry was studying. The available commercial balances weighed samples of around one ten-thousandth of a gram, and Dr. Lowry was dealing with samples in the area of one millionth of a gram. The hasty assumption by a nonscientist is that the solution to this problem must have been complicated.

During World War II, Dr. Lowry joined Dr. Otto Bessey at the newly formed New York Public Health Research Institute, where they carried out nutritional studies of children throughout the city’s boroughs. Putting some of his microtechniques to work, Dr. Lowry was the first to do vitamin assays of children from whom extremely small blood samples were taken by pinpricks at the tips of their fingers. Although pinprick tests are now standard procedure, tests for nutritional deficiencies had previously required much larger blood samples, thus prohibiting large-scale screening.

A comprehensive nutrition survey was made by the institute for the city government, documenting iron and vitamin C deficiency in some areas of the city. Later Dr. Lowry did a study of 100 Royal Canadian Air Force personnel to determine how much vitamin C can be retained by the body. It was determined that one 100-milligram vitamin C pill each day fills the body to its capacity for the vitamin, and that any more than this amount per day is completely wasted. Data from those carefully controlled measurements are quite relevant today in view of discussion on the desirability of taking much larger daily doses than 100 milligrams of vitamin C to prevent colds.

For the past twenty-four years at Washington University, Dr. Lowry and his co-workers have devoted themselves primarily to one of the most complex challenges to biochemistry: elucidation of processes in individual cells of the nervous system. The microbalance is only one of many microtechniques they employ. It is an important tool because the weight of a cell type or clusters of cells in an organ must be determined. Within the smallest cell are thousands of molecules, even the largest of which can be measured only by indirect methods. One ingenious method developed by the Lowry group is a chemical amplifying “trick” to measure the amount of certain reactive molecules in a cell. The minute products of these molecules are built up in controlled chemical reactions to the point where the final products can be measured with great accuracy and are unerring indicators of how much of the original...
An inside view of the microbalance: A tissue sample is lifted on a sable hair to a minute pan, visible at the top of the glass slide. The pan is on the tip of a fine strand of quartz fiber, which bends to weigh sample. The balance is housed in a hypodermic syringe.

Dr. Lowry looks through microscope at sample of one of his famous devices, the microbalance, which is capable of weighing single cells.

Dr. Lowry, center, and Dr. Philip Needleman, right, conduct laboratory class for medical students.
reactive molecules were present in the cell. These critical reactive molecules are protein molecules called enzymes which exist by the thousands in the smallest cell, acting as catalysts in reactions vital to the life of the cell. The amplification technique to measure enzyme quantities is nearly limitless in its potential sensitivity and is an invaluable biochemical tool.

Being able to determine the quantity of cell components such as enzymes is an essential first step. But the raison d'être of this painstaking work is to understand the precise metabolic actions in the cell, such as those involving enzymes. To illustrate, it was found by Dr. Lowry and his associates that a certain chemical inhibits an enzyme which controls the breakdown of the sugar, glucose, in cells. It is interesting to note that in 1969 the late Dr. Helen T. Graham and Dr. Robert M. Burton of the Medical School wrote in nominating Dr. Lowry for an award: “Few, if any, others in the world have made equal contributions to the micromethods for enzymatic studies. Without these techniques detailed analysis of normal function and of disease in complex tissue would be impossible.”

They also pointed out: “Professor Lowry's micromethods, while developed primarily to study the central nervous system, have been applied to many scientific areas. For example, we would like to quote references regarding two major nutritional diseases and their chemical study in which Dr. Lowry's methods were employed.”

They went on to explain that these techniques were used in testing Guatemalan children suffering from kwashiorkor, probably the most widespread disease of severe protein deficiency. The techniques also were applied in the Philippines to test patients for beriberi, a nutritional disease induced by a deficiency of thiamine. Such applications derived from basic biological studies aren't unusual; they serve as good examples, however, that really fundamental findings are often beneficial to seemingly unrelated areas.

Another example of how microtechniques are applied in Dr. Lowry's lab at the level of the individual cell is the measurement in nerve cells of precisely what part of the cell uses up most of the energy during its electrical firing. This is a very basic observation, of course; but many such observations must be made and interrelated before there can be an understanding of general nervous system processes such as fatigue. These extremely detailed biochemical measurements are a far cry from romantic extrapolations in popular magazines and books to the effect that biochemists “soon will manipulate cell chemistry” as an engineer controls a computer, or that there will soon be chemicals, so-called “smart pills,” to improve people's memory.

This kind of fantasy may be titillating to some, but the reality is that man's actual knowledge of cells, and of nerve cells particularly, is still at a primitive level. And Dr. Lowry and others are convinced it will stay there unless individual cells are first understood in much greater detail.

In giving one of the Harvey Society Lectures in New York City in 1962, which is a high honor for any scientist, Dr. Lowry concisely outlined the need for making detailed measurements of the many individual cell types of the nervous system or of other organs.

“It is not difficult to justify studies of individual cells,” he began. “If every cell in an organ were alike this might not be true, but no tissue or organ in the body is built of a single cell type, and even a few special cells sprinkled through an organ may have great significance for function . . . cells otherwise identical may not all be in the same state of activity at any given time. In the extreme case, one really bad cell can multiply and cause destruction of the entire body. For these reasons and many others it seems necessary to study not only whole organs, but also individual cells of these organs.

“This is particularly necessary in the case of the nervous system because of its unusual complexity. The brain is a wonderful mixture of nerve cells of all sizes and shapes with a rich mixture of glial (structural) cells of several varieties. It would be hard to imagine that all components of the brain are chemically alike . . . certainly a homogenous brain could not do much thinking . . . I see no way to make the full chemical study of any living thing really simple. With thousands of enzymes and metabolites (food-stuffs) present in every cell, and with an organ that has the anatomical and functional complexity of the brain there are bound to be complicated problems that can occupy many people for some time. We can agree that the brain is worth the effort.”

To his students and co-workers Dr. Lowry shows a commitment to his work that isn't readily apparent to an outsider. A man who will always take time out to explain a point to a student or to make a visitor to the department feel at home doesn't exactly give the impression of J. D. Watson's model of the zealous scientist in the book The Double Helix.

Dr. Lowry is low key, but his deep commitment to his work was described by his former colleague, Dr. Passonneau. An outspoken and straightforward individual who is now chief of the National Institutes of Health Section on Cell Neurochemistry, she said, "I want to make it plain: I'm no Madam Curie. I'm a competent scientist, but Dr. Lowry is the real genius behind this work . . . [In this research] you have to have the commitment that makes you never want to do anything second best. Dr. Lowry is my idea of a man who has that compulsion. He's a great scientist and it's not in the hope of getting the Nobel Prize, or anything like that. It's for the sake of the work itself."
The founding of Washington University, like all human endeavors, was made possible through the convergence of men and circumstance. The protagonists of the drama were Wayman Crow, businessman, and William G. Eliot, divine. The circumstance was the expanding of the American West, which made the trading post established by the French in 1764 at the confluence of the Missouri and Mississippi rivers a maturing city aspiring to permanence, culture, and a place in the development of the great frontier.

Wayman Crow, drygoods wholesaler and mid-nineteenth-century state senator from St. Louis, was not a man to stand on ceremony. In his second term in the legislature he happened to see, lying on the desk of a colleague, a charter for an educational institution. He studied it and decided it was a good model for a project he had long had in mind. So he sat up late one night writing a charter for a tax-free institution of education to be located in St. Louis, submitted it to the legislature and, on Feb. 22, 1853, Gov. Sterling Price signed it into law.

There was, it seemed, one eccentricity of Mr. Crow’s noble action. He had acted alone. When he had to decide what to call the institution, he filled in the name Eliot Seminary and when he came to that portion of the charter which required the names of the incorporators, he filled in that part, too.

The following day, William Greenleaf Eliot wrote in his diary, “An Eliot Seminary has been incorporated by the present Legislature; but I know nothing of it.” If the newspaper account, which apparently informed Mr. Eliot of the event, had been complete, it would have taken other St. Louisans by surprise also, for Crow, a member of Eliot’s Unitarian congregation in St. Louis, had put down the names of 17 incorporators—himself, Mr. Eliot and 15 other congregation members.

Wayman Crow must have been an audacious man. Born in Kentucky, he entered school at seven and dropped out before he was twelve, when he was apprenticed to a store owner for a five-year term. By sixteen, he owned his own store, having negotiated a credit purchase, and at twenty-seven he had accumulated the tidy net sum of $21,000. He came to St. Louis in 1835 in search of broader pastures.

Mr. Eliot, on the other hand, had come to St. Louis a year before in search of a different kind of green pasture. He had taken a winter’s engagement as minister of a newly formed Unitarian congregation. Eliot, then twenty-three, was, in his own words, “a young, ambitious preacher” who felt his best prospects lay in the West.

St. Louis did not disappoint them. In 1830 her population was 5852; by 1850, it was 77,860. The education of the city’s children and youth was a subject much discussed by mid-century. That it had been the topic of more than one Eliot-led congregational meeting is likely, for Mr. Eliot had made it clear to his parishioners that he expected them to give generous financial and moral support to worthy causes.

But Crow’s brash act of 1853 was more than anyone expected. Years later Eliot wrote: “It took us by surprise, and, at first thought, caused some amusement; for none of us had dreamed of such a thing, and an educational enterprise seemed quite beyond our strength. But, upon examination of the charter, it was found to be a document of extraordinary merit, and capable of grandest use. Its possession constituted a divine call; and, after talking it over for a year, we determined to organize under it, and go to work.”

Apparently no one felt a divine call should be answered in haste, for it was Feb. 13, 1854—almost a year later—that the incorporators met formally for the first time. As Eliot recalled, “The puzzle at first was where to begin . . . ” They began ambitiously, if prudently, deciding that when money deemed sufficient was at hand, they would launch an industrial school and a collegiate department.

No man of the cloth seems to have been more practical about money than Mr. Eliot, nor more able to inspire other men to be impractical. By 1864, he was able to report that $478,000 had been contributed to Washington University, four-fifths of which had come from members of his church. Mr. Eliot himself had given large sums, reaped not
from his meager salary, but from his continuous investment of small amounts in land. A St. Louis businessman was once prompted to remark that had Mr. Eliot been his partner they would have owned half the money west of the Alleghenies.

As could be expected, all did not go smoothly, nor as planned, during those early years. The venture suffered a serious identity crisis, both in the literal and the figurative sense. Its name changed, or nearly changed, five times in as many years, and its first educational direction almost ended in financial disaster.

In 1854, in deference to Mr. Eliot's wishes, the directors adopted the name Washington Institute of St. Louis to replace that of Eliot Seminary. They operated under that name for a year before someone suggested that perhaps the charter should be amended so that they could be sure the operation was legal.

To that end, Mr. Crow was to introduce an amendment to the legislature. Before he could do so, however, a certain Senator Holmes introduced a charter for the Washington College in St. Louis, and the bill was passed and signed into law.

It was evident to everyone that confusion would result if there were both a Washington Institute and a Washington College in St. Louis, so some "unauthorized parties" (according to University records) introduced an amendment to change the name to Lafayette Institute instead of Washington. The bill was passed and on the desk of the governor when he received a "telegraphic message from St. Louis" asking him to veto it.

Meanwhile, the board, casting around for a new name, decided upon O'Fallon Institute in honor of Colonel John O'Fallon, whose gift of land was the first received for the new enterprise. Colonel O'Fallon consented and the board voted to accept the new name. Before the name was legally written into the charter, however, Senator Holmes announced that Washington College would not be incorporated. When Colonel O'Fallon learned that the name Washington was again available, he withdrew consent to use his name.

It was actually two more years before formal legislative action was taken and by then one more change had been decided upon, so that in 1858 the charter was amended officially to name the school Washington University.

During this period and in the decade that followed, the character of the institution was beginning to take shape. One of the main thrusts was concentrated on establishing a polytechnic institute as a practical arm of the University, but the building begun for this institute was beleaguered with setbacks. Funds ran out and the Civil War intervened.

Construction at Chestnut and Seventh, which was begun in 1858, was not completed until 1866 at a final cost of nearly $500,000. At least once during this period Eliot referred to the unfinished structure as "that premature ruin." Its presence seems to have been a source of embarrassment and disappointment for the founders. When completed, it was an imposing structure of five stories, containing on the first floor five commercial spaces, the rent of which was to pay operating expenses.

However, the financial burden which the polytechnic institute had imposed upon the corporation was enormous, and in 1868 both the building and the operation of the institute were transferred from the University to the public schools.

The situation during these years was somewhat brightened by the fact that in 1856 the corporation had begun its collegiate department in Academic Hall, a modest structure at Seventeenth and Washington (which cost only twice as much as the original estimate). And, in 1861, it had completed a much larger building at that site.

So with the experience gained in the attempt to establish a University polytechnic school and with the organizational structure of several schools, including a school of engineering and a school of design, already begun, the University board went on after 1868 to build a sound institution worthy of the name it had adopted with such difficulty and such hope.
INAUGURAL ADDRESS

On February 29, 1872, William Greenleaf Eliot was inaugurated as the third Chancellor of Washington University. Until that time, he had shaped the institution of which he was co-founder as President of the Corporation, a position he retained as Chancellor. A glimpse of his vision of a national, uniquely American university serving its city, its region, its nation, and its civilization is presented here in the opening section of his inaugural address.

GENTLEMEN OF THE BOARD OF DIRECTORS, ALUMNI OF WASHINGTON UNIVERSITY, AND FELLOW CITIZENS: In addressing you, my first and natural feeling is that of unfitness, holding myself as I must, for the moment, in memory of those who have preceded me here on like occasions.

At the inauguration of the University itself, we were addressed, to our lasting honor, by Edward Everett, the most accomplished of American orators. It is fifteen years ago, but his well chosen words of eloquent appeal, his glowing pictures and wonderful wealth of imagery, are still fresh in our memory. He had no equal in his sphere while he lived, and his superior is not likely to arise.

Next came the strong and manly address of Chancellor Joseph G. Hoyt, whom we remember with so much affection; a man of true heart, of earnest thought, who saw through the disguises of human nature by virtue of having no disguises himself; a perfect educator, who knew how to plant good seed in the pupil's heart and make it grow as of its own accord, cherishing the individuality of every mind and adding to it the inspiration of his own. His students scarcely knew whether it was he who taught them or whether they discovered the truth for themselves. He led them to it. He opened it in their own thoughts. He taught them to find it in their own nature. Above all, he taught them to love truth for its own sake; not merely, as some philosophers advise, for the intellectual exercise of seeking after it, but for its own precious sake when found. Some of his pupils, who went through the whole college curriculum under his guidance, are here with us, and I appeal to them for the truthfulness of my words.

Among all the trials and losses of our earlier career, and they were many, the death of Chancellor Hoyt was felt the most keenly.

Of his immediate successor, William Chauvenet, a like record of mingled pride and sadness remains. He, too, was one of nature's noblemen. He was not only a man of genius, but had improved his natural gifts by an intellectual and moral culture as rare, in the present day, as it is admirable. Before he came to us, his reputation was fully established as a ripe scholar, standing in the small rank of foremost men in the departments of pure and applied science; and while with us he gained further honors by works of distinguished merit, which will long keep his memory green. His name conferred early distinction upon this University. It is a great thing in our history to have had such a man at our head, and by the association the name of Washington University is already known in all parts of the world where the lovers of science are found.

No better proof could be given of the inherent vitality of our young Institution than its ability to bear the loss of two such men, in the days of its forming period, without feeling its progress seriously checked or its usefulness permanently impaired.

It may be further worthy of note, as showing how the older colleges send out their offspring to repeat their work, that these two, our honored leaders, were classmates, "first scholars," graduates of Yale, who sought to do honor to the loving mother of their youth by here illustrating the lessons she had taught.

Such were my predecessors, who "have gone before." I name them with profound respect, not unmingled with pride. But what can a man do that cometh after the king?"

Most fortunately for me, the work required at my hands is very different from that which devolved upon them.
“We are here not so much to consider how a university may be conducted as how a university may be built.”

It was their part to show, by elaborate argument, the principles upon which sound education rests. The relative value of classical and scientific studies, and the place properly assigned to each, were so ably treated by them that there is no room for me to enlarge. The same subjects, and almost everything else connected with the "higher education" have, also, of late, been thoroughly discussed by President Porter of Yale, by President Eliot of Harvard, by President White of Cornell, and by President Barnard of Columbia College, N.Y., to mention no others, in this country; and by Froude and Mill and others, of the older universities of Great Britain, in their several inaugural addresses, recently published and accessible to all; so that it would be difficult for anyone to throw new light upon the theme.

Nor do you expect it of me. We are here not so much to consider how a university may be conducted as how a university may be built.

At times, in the moments of self-conceit, we may think that we have done much; but in the thoughtful hours we cannot but deeply feel that to stop where we are would be a blunder and a wrong. Our University has attained to a healthy infancy, but not to the growth of vigorous youth, much less to that of mature manhood. All that we have heretofore done only serves to show the greatness of the opportunity, the magnitude and importance of the work which yet remains.

From the first inception of our enterprise, which was no more than the setting up of a grammar school under the care of two teachers, our aspirations and ideal have been unchanged. It is the permanent establishment of a University proper, including all departments of learning, art, science and aesthetic culture; a University, not fashioned in servile imitation, after the recognized patterns of the past, either ancient or modern, in the old world or the new, but in accordance with the wants of the present time and of the great Western world in which we live; an American University which shall touch with one hand the workman's bench, and with the other the astronomer's observatory; bringing practical and scientific culture within the reach of the apprenticed workman, for his elevation to the rank of intelligent skilled labor; and at the same time offering to all who are ready to receive it the best advantages of the highest education.

We recognize the duty of an American University to address itself to the everyday working world of a republic where every man is a sovereign, by opening its doors as wide as possible to everyone, male or female, who can find time and disposition, if it be but for a few hours a week in the long winter evenings, or by occasional consultation with competent teachers appointed for the purpose. Thus, the best educated mind of the university world should be brought into immediate contact with the practical organization of the working world, to the advantage of both. Therefore, the conventional wall of separation between working men of the hand and working men of the head may be thrown down. The fancied preeminence of the learned professions would disappear. A good education would gradually come to be recognized as a necessity in the training of every young man, whether for intellectual or mechanical pursuits. We believe that this is not the age or country, certainly not in this valley of the West, for the great activities of intellectual culture to keep aloof from the common mind. The University should be the leaven to act with creative and purifying power until the whole mass is leavened. Such has been and is our aim. Almost the earliest direction of our thoughts was towards the industrial interests. The O'Fallon Polytechnic Institute, organized with reference to the working classes, was established before the collegiate and literary departments, and has but recently been developed into its higher legitimate work of an advanced scientific school. We hope never to lose this feature of our Institution, but, as we acquire greater strength, to offer the instruction of our physical and chemical laboratories and of our School of Art and Design, more and more freely, to all teachers, both of public and private schools; to mechanics and manufacturers, and to that large class of intelligent women, who, without seeking for notoriety, desire, by useful employment, to secure to themselves the means of usefulness and of independent self-support.

The plan is not Utopian. We see it directly and clearly within our reach, at moderate cost, with assured results, as soon as our endowment funds shall have attained to the point of respectable University strength. At present there is but enough to rattle in the purse, to show its emptiness.

But, while speaking of the practical tendency which necessity imposes upon American institutions of learning, we do not forget what we have already intimated, that the peculiar province of every university, properly so called, must always be found in the highest departments of intellectual culture. It is not, primarily, a society for the diffusion of useful knowledge, nor a common school system for the education of the masses, however important a supplementary part it may take in both of these directions. Its distinctive work is in the higher realms of thought, there building upon the highest attainments of the past to reach upward to still higher, and thus enlarge the boundaries of human knowledge by discovery of new truths and by new applications of the old. Not quantity but quality of work is the ultimate test of a university's success. To educate one man thoroughly, to carry him above the standard of his times, to make him one of those who stand first, leading, not following the world's movements, confers more honor than to graduate a thousand upon the usual dead level of moderate scholarship. Nay, in this respect and rightly considered, quality of results includes quantity, and one
man educated to do first-rate work weighs more and counts more than many who are only competent to deal in second-hand ideas and to follow beaten tracks. One best is more than many good. The man who looks a little further than his contemporaries discovers a new continent. The man who thinks a little more profoundly, invents the telegraph or reveals the laws of light. To train one such man, or to clear his way before him, adds more to the world's wealth, and gives a greater impetus to the world's civilization than numerical figures can compute.

Therefore it is, that the University should be supplied with all needful facilities for giving the best education to the few, as well as a good education to the many. The number may be small of those who are by nature capable of receiving the best gifts, but the best gifts should be kept ready, and no one, honestly seeking for them, should be turned away.

It is specially the part of great universities to yield as little as possible to mere popular prejudices; to maintain the necessity and sacredness of learning in times when it is generally despised or depreciated; to tend most assiduously the lamp of the higher education, when the gusty breath of common clamor is blowing most violently upon it; and to uphold the standard of intellectual training with the bravest and highest hand, just when the idle public is most careless about its ensign, or even ready to trample it under foot.

An expensive programme, you may say, by which the average cost of education, dividing the total outlay among the recipients, would be fearfully great. Yes; but there are some things the value of which cannot be weighed in the balance even with fine gold.

When the city of Leyden was besieged, three hundred years ago, it came to pass, as in the old mythological days of classic warfare, that Neptune and Eolus, forming alliance with the Silent William, in answer to the prayers of a suppliant and heroic people, poured in their irresistible forces upon the panic-stricken invaders and rescued the beleaguered citadel. For four months the sufferings of famine and pestilence had been patiently endured. Six thousand, out of a total of forty thousand, had perished. The remainder were a ghastly crew, half starved, half maniac in their despair. When the boats came into the canals of the city and bread was thrown to the people who crowded along the banks imploring for food, hundreds who had survived the famine fell victims to the suddenness of relief. But their city was saved and their nation and the cause of freedom with it. The grateful thanks of their countrymen and of their great leader came as their reward. The people of Leyden were called upon to name the recompense for their sufferings, some monument of gratitude, in everlasting memorial of their self-sacrificing patriotism.

They asked that a university should be established there; and a few months afterwards, while the struggle for freedom and national existence was yet going on, the corner-stone of Leyden University was laid, with elaborate inaugural ceremonies, as if a triumph had been decreed.

It was a noteworthy reward for unparalleled services; and as, when Solomon chose wisdom, riches and honor were "added thereunto," so it happened to the brave city of Holland. From that day to this, its University has been the prominent fact of its history.

What William of Orange did for Leyden we may do, if we please, for this city, on a far greater scale and with greater results, by so much as the Mississippi valley is greater than the delta of the Rhine.

Who would question the usefulness of such a work? We enter into no argument to prove it, for those who do not see it for themselves are not likely to feel any interest in the enterprise.

But we may say, and with emphasis, for it touches the exact point to which your attention is called, that the usefulness of which we speak is not that of a struggling, feeble Institution, doing battle for "dear life," laboring, as we are, to do the maximum of work with the minimum of workers, counting every dollar spent as if it were a drop of the life's blood, and afraid to look at its balance sheet when the year comes round. Every step taken is, indeed, so much gained. As our record now stands, and taking things as they now are, we have reason to feel encouraged. We should be ungrateful to complain, as if our progress had been slow. Very few Institutions, under circumstances of so great difficulty, have accomplished more in the same time.

Washington University, in its ante-typal idea, prefigures an Institution worthy of the great name it bears: a name which is the symbol of Christian civilization and American patriotism, and to which, therefore, no thought of sectarian narrowness or of party strife can ever be attached; an Institution of learning, at once conservative and progressive, with foundations so broad that there is room for every department of human culture, and so deep that neither praise nor blame shall shake its allegiance to truth. We would found a University so strong in its faculty of instruction, so generous in its ideas, so thoroughly provided with all faculties of education, so hospitable to all comers and so rich in its benefactions conferred, that it should gather round itself a constituency of learning and science, and give tone to the educational movement of the region in which we live. We would found a University so widely acknowledged in its influence, that St. Louis and Missouri should be honored throughout the world by its being established here; and the best class of citizens from all parts of the land, the intelligent, the enterprising, the philanthropic, the skilled laborer and artist, men of wealth and men of intellect, the true bone and sinew, the nerve-power and brain and controlling will of the republic, should be attracted here to find a favored home.

“To educate one man thoroughly, to carry him above the standard of his time, to make him one who stands first... confers more honor than to graduate a thousand upon the usual dead level of moderate scholarship.”
THE MAKING OF A PH.D.

By Robert Armbruster

At the university, where tradition is a byword, nothing changes quickly; most things change only in detail; and some things change not at all. Among the activities so basic to the function of the university that even its form is unchanging is the doctoral qualifying examination.

No matter what the field, it is a face-to-face examination by senior scholars certifying the candidate's knowledge of the broad field and ability to carry on independent research. It is the passport to the final phase of doctoral training—the dissertation.

Pasted on the door of a small office in the tower of Washington University's Karl D. Umbrath Hall, the office of graduate assistant Ronald Bittel, is a newspaper clipping that reads:

Munich, Germany, May 19 (AP)—Police said yesterday that a 26-year-old Munich University student worked himself to death. They said Ulrich Schroeter died of mental and physical overexertion caused by the long hours spent on a doctoral dissertation on church law. In his living quarters, police found the following hand-made signs posted on the walls: "persevere," "only a short stretch to go," and "it will soon be over."

The grim clipping serves as an unnecessary reminder to the 24-year-old Bittel that the road to a doctorate, whether in Munich or St. Louis, is a grueling one. It's unnecessary on two counts: first, the nature of the pursuit becomes obvious from the first semester in graduate school—for Bittel, it was obvious from the first days of that semester—and second, Ron Bittel is a very relaxed, though conscientious, young man. Moreover, he now has one of the biggest hurdles in the long path to the Ph.D. behind him. Late this spring he successfully passed both the written and the oral portions of his qualifying examination, stages of which are pictured on the following pages. Ahead lay only the dissertation ("Only the dissertation!" Bittel laughs), its subject—the unique character of church-state relations in Belgium during the nineteenth century—and Bittel's planned approach to it approved during the May examination.

Bittel brought to his exam a healthy amount of self-confidence based on three successful years as a graduate student in history at the University—all three of them as a Danforth Foundation Teaching Fellow—and on four demanding undergraduate years at Manhattan College in New York. Another spirit-builder was his notification, six weeks before the exam, that he was one of two Washington University history students to receive Fulbright Scholarships for study abroad next year. The other Fulbright scholar is his good friend and "Umbrath tower-mate" John Grundman.

With all this going for him, Ron Bittel, in the weeks preceding the all-important examination, experienced the same feelings of inadequacy, uncertainty, and fear that were common to most of the 15,000 doctoral candidates produced by universities in this country last year; fear that the countless hours in the library, at home, anywhere and everywhere he could study, might suddenly become but an edifying exercise—that he might in the end fail the exam.

"All the way up to a week before the first part of the written exam I was terribly nervous and really pushing on my reviewing," Bittel says. "Then I realized this was it. What I knew, I knew. What I didn't know then, I probably wouldn't know six or seven days later. So I relaxed—that is, until I was about to enter the room for the oral. Until we really got going my stomach was all in knots."

The pressure Bittel was under during his examination was reminiscent of that which he had felt nearly three years earlier, when he first enrolled as a graduate student at the University. It was the same but with one difference: the oral examination pressure lasted two hours; the anguish of that first semester went on for nearly six months. Cause of that initial anguish was a writing seminar required of history graduate students and taught by former department chairman Jack Hexter, who is now at Yale University.

"It was a traumatic experience right from the start," Bittel recalls. "I had no real familiarity with seminars—I guess I didn't really know what they were—and while I had been writing a fair amount for nearly a decade, I was wholly unprepared for Hexter.

"He gave massive assignments, ten pages or more of writing each week, and every assignment required rewriting. On the very first assignment, I was utterly destroyed by his comments. On the back of the paper he wrote something like, 'I am sure that somewhere in this enormous stylistic trash heap there is a great deal of intelligence. However, life is short, and I'll be damned if I'm going to ferret it out.'"

"I was depressed for two weeks. And even after I got over the initial shock, the pressure continued for the whole semester. Knowing you had to give your best all the time, and
The Making of a Ph.D.

For the Ph.D. candidate, the years of on-campus study are brought to a close by the Ph.D. qualifying examination. On the night before Ron Bittel's oral exam, he and his roommates and a friend relaxed over supper.

Bittel spent a portion of the evening answering a question for a student in one of the classes in which he did supervised teaching.
trying to alter your writing style fundamentally, too—well, it was pure hell."

**Bittel Concedes** that the fiery baptism had a salutary effect, and today he regards Hexter, as well as his whole Washington University experience, with appreciation and respect.

Bittel's graduate career at the University, while relentless (some 20 courses and seminars: 72 credits), went relatively smoothly and, according to the young history scholar, was "very satisfying." He particularly enjoyed the supervised teaching he did as a credit-earning part of the history department's Danforth Foundation-supported program. (Washington University was the first of a handful of universities to receive a Danforth grant to launch a doctoral program that incorporates training in teaching and supervised teaching experience.)

He also credits the department with displaying a healthy kind of self-criticism which he thinks will make the graduate program even stronger in the future. "But what I like best about the place is that it's not so big that you don't know your fellow graduate students and that you're estranged from the faculty. From the day I got here I was able to see any member of this department, usually within a few hours, always within twenty-four hours."

When it came time for his oral examination on May 10, however, he wished the four professors on the examining committee could have been available several hours earlier than the scheduled 3 p.m.

"I woke up that morning knowing the exam was not for several hours, and I just wanted to stay in bed and sleep—but I couldn't," Bittel says.

The qualifying examination in history has five parts: a four-hour written examination on each of four periods (for Bittel, whose specialty is European history, they were Ancient Rome, the United States since Reconstruction, the Old Regime—roughly from the Reformation to the French Revolution—and Modern Europe), plus a two-hour oral examination by the professors who prepared the essay questions. (Generally, if there is more than one specialist in a field to be covered on an individual's qualifying exam, the candidate may choose which man he wishes to have serve on his examining committee.)

"I was more satisfied with my written answers than with those during the oral," he says. "In there, my answers were much too vague and confused, partly, I suppose, because of the tension and partly because of large gaps in my knowledge."

If there were, in fact, large gaps, and if they were noticeable to the four specialists asking the questions, no one intentionally took the opportunity to trap the candidate with an unexpected or unfair question. If anything, Bittel's interrogators pursued points of information in ways likely to elicit the most complete answers they believed he was capable of delivering.

"You hear stories from other graduate students about the wicked curve this or that professor threw at them during their exams. The only real shock to me—and it was a positive one—came as soon as I sat down; it was Von Laue's question about my dissertation."

**Professor Theodore Von Laue**, in whose office the oral examination took place and who, as a specialist in Bittel's field, chaired the gathering, asked his student to describe what he intended to do in his dissertation. After talking for nearly a half hour about his interest in church-state relations, the situation in nineteenth-century Belgium, and the availability of sources on the subject—with occasional interruptions for specific questions—Bittel was stunned ("I felt as if my mouth dropped five feet") when he heard Von Laue conclude, "Well I guess my time is up; who wants to be next?"

"I had expected a real going over on the modern period," Bittel confesses. "I couldn't believe it when he said he was finished."

The remaining hour-and-a-half was devoted to questions from the other examining committee members: Professor Edward
Bettel's examiners were four senior faculty members: Professor Edward Wettin (below), Associate Professor Paul Lucas, Professor Theodore Von Laue, and Associate Professor Barry Karl.

The oral examination took place in the book-lined office of Professor Von Laue.
After a brief discussion, Bittel's examiners call him back into the office to tender their congratulations.

After a summer in New York, where he'll "set up shop at the public library," the young Fulbright scholar will head for Louvain University in Belgium for a year of study and work on the dissertation. When the dissertation is completed, he will return to Washington University to face an examination on it also. His attitude toward that one is more relaxed.

"When you're writing a dissertation, your major professor approves it chapter by chapter, so by the time you've finished, you're pretty well prepared to defend what you've done."

By then—a year from now perhaps, but probably longer—the ordeal of the qualifying exam will be just a fading memory. Certain moments of that day in May, though, will undoubtedly remain vivid for years, such as Bittel's enforced "estrangement" from his professors when the two hours of questioning had ended. Bittel was asked to step into the hall while the committee discussed his performance, an absence which to the weary candidate seemed interminable. In fact, the conference lasted less than five minutes, and the only criticisms were those Bittel came to on his own afterwards—principally his vagueness on certain answers. ("At times he was like a skillful bull-fighter," one professor suggested.)

But when Bittel re-entered the room, he knew instantly, from the group's relaxed manner and from the friendly greeting of one of the men ("Sorry to have kept you waiting so long, Ron"), that the ordeal was over, that he had won the unanimous endorsement of his learned teachers.

Extending his now steady hand to accept their congratulations, he thought, wryly, "Only the dissertation to go."

Weltin and Associate Professors Barry Karl and Paul Lucas. Many of their questions were based on, or sought clarification of, ideas expressed by Bittel in his written exams, taken on the four weekdays immediately preceding the oral.

Uncertain on some points, Bittel nevertheless seemed in control of his material throughout. During especially long answers, when he was able to expound on events and relationships in nineteenth-century Europe, his professors couldn't have helped but catch some of the excitement Bittel feels for his subject. He talks of kings and popes of the era with astounding familiarity, as if they were neighbors, or at least contemporaries; and he speaks nearly always in the present tense: "William, the Dutch king, signs a concordant with the Pope in which William is allowed to cancel papal nominations for the bishopric, and it is the Belgian Catholics who become incensed about this and make an alliance with the Liberals." Listening to his detailed and lucid exposition of the changes in outlook that came over Pius IX during his papacy, one feels that here is a teacher who will one day fire the imaginations of the very bright and the very slow with equal ease.

Actually, now that his teaching assistantship is over, Bittel probably will not face a class for fifteen months or more. After a summer in New York, where he'll "set up shop at the public library," the young Fulbright scholar will head for Louvain University in Belgium for a year of study and work on the dissertation. When the dissertation is completed, he will return to Washington University to face an examination on it also. His attitude toward that one is more relaxed.

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Washington University’s 125th Anniversary Celebration
Record of Events


Conferences


Symposia
Biomedical Symposium: Andrew Huxley, Nobel Laureate and Professor and head of Physiology, University College, London, England, plant biology and ecology; Sir Peter Medawar, Nobel Laureate and head of the Division of Surgical Sciences, Medical Research Council, Middlesex, England, immunology; Gobind Khorana, Nobel Laureate and research professor in the Departments of Biology and Chemistry, MIT, molecular biology; George Palade, Nobel Laureate and director of the Division of Cell Biology, Yale University, cell biology; James Black, director of Therapeutic Research Division, Wellcome Research Laboratories, Beckenham, Kent, England, pharmacology; Andrew A. Benson, professor of biology, Scripps Institution of Oceanography, University of California at San Diego, plant biology and ecology; and Walter Bodmer, professor of genetics, University of Oxford, Oxford, England, genetics; Edison Theatre, Mon. and Tues., Oct. 16-17.


Lectures/Speakers
Wendell G. Scott Lecture, Mallinckrodt Institute of Radiology, Dr. Donald Fredericksen, director, National Institute of Health, “Minding the Biomedical Continuum,” Scarpellino Auditorium, Tues., Oct. 10.


Institute of Radiology Lecture, Dr. Juan M. Tavera, former head of the Institute, presently Radiologist in Chief, Harvard’s Massachusetts General Hospital, Mon., Nov. 13.

“Meet the Writers,” readings by Washington University authors in Women’s Building: Donald Finkel, Poet-in-Residence in English, Thurs., Oct. 19; William Gass, Professor of Philosophy, Tues., Oct. 24; Howard Nemeroz, Pulitzer Prize-winner and Edward Mallinckrodt Distinguished Professor of English, Tues., Oct. 31; Stanley Elkin, Professor of English, Tues., Nov. 7; and John Morris, Professor of English, Thurs., Nov. 14.


Performing Arts

Morton Subotnick’s Electronic Piano and Light Show, Edison Theatre, Sun., Oct. 15.


One Flew Over the Cuckoo’s Nest, Edison Theatre, Fri.-Sun., Nov. 10-12.


Exhibitions
School of Architecture, Exhibition on History and Development of the Washington University Campus, Steinberg Gallery, daily, Oct. 1-12.


Student Activities


48 125th Anniversary Issue
ON FEBRUARY 3, 1963, an era ended: the last streetcar on the "University" line serving campus made its last run. In "Comment," Frank O'Brien, the late editor of the Washington University Magazine, himself an alumnus, mused: "An old, old friend has finally passed away. The news that the University has lost its claim to 'streetcar college' fame should ring a nostalgic bell in the memory of many an alumnus. If it weren't for the trolley, it is doubtful if some of us would even be alumni today. In times past there were a variety of lines to campus. On all, the ride to and from campus provided a great deal more study time than we would have managed at the wheel of a car. Many students did their studying on the trolley—a lot of it standing and holding an overhead strap in one hand and a book in the other. . . .

"In the last stretch of the University line, the motorman would give his charge her head and the car would sway and roll like a sailboat in a stiff breeze. Freshmen were known to turn green, but upperclassmen had earned their sea legs and could study away without a twinge of mal de mer.

"Today a growing number of students come to the campus by jet and ocean liner from all over the world. The days of the 'streetcar college' are gone."