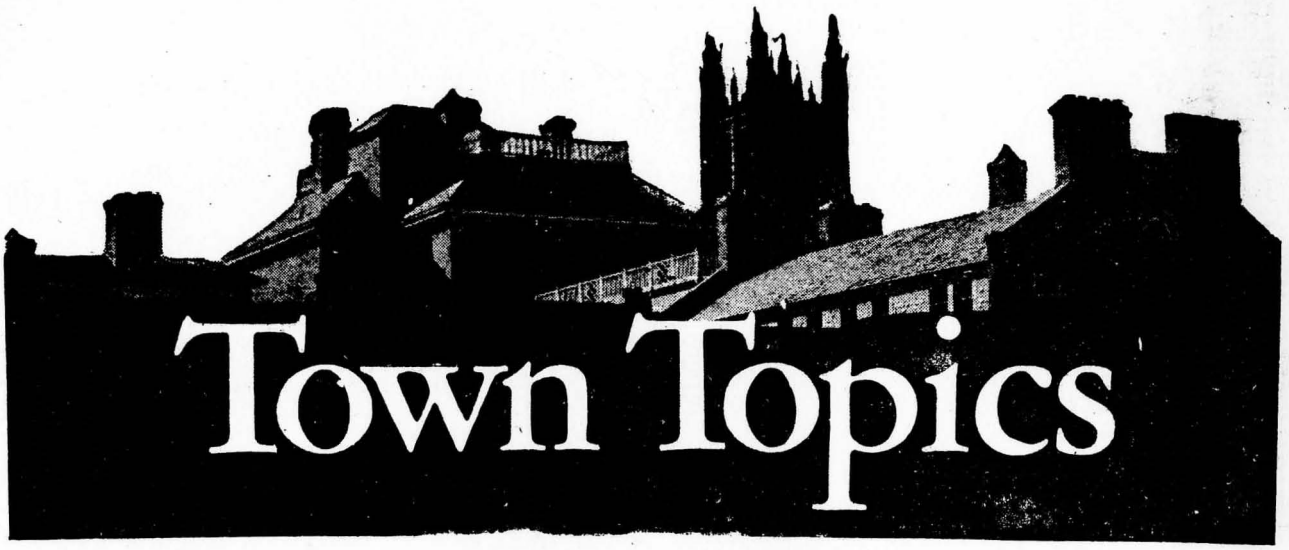


Town Topics

WE NOMINATE

Herbert Feis, economist, historian and adviser in high government circles, whose analytical writings and distinguished public service over a span of three decades were limelighted this week as Princeton University awarded him one of the highest honors within its command—the honorary degree of Doctor of Letters. The burst of applause which followed the presentation of the degree to the 68-year-old Princetonian was not only tribute to a brilliant record but also a measure of the impact of the printed word in a community whose primary industries are education and research.

New York-born and a member of the Institute for Advanced Study at various times since 1948, Feis this spring capped his literary achievements by carrying off the Pulitzer Prize in History for his "Between War and Peace: the Potsdam Conference", the fourth in his five-volume diplomatic history of the Alliance against the Axis in World War II. Of comparable significance in the related spheres of scholarship and historical writing was the publication, weeks after he had won the Pulitzer Prize, of his fifth major work in ten years, "Japan Subdued: The Atomic Bomb and the end of the War in the Pacific."

The latter, the first volume to recap the complicated actions of all of the nations involved in the story of Nippon's fall, promptly won literary acclaim in all sections of the United States, including the normally "isolationistic Middle West". From one critic came this judgment: "This is not merely a book concerned with one of the most vital human and historical questions of our time. It is a work which, by uniting detachment and scholarship to the central moral and political problems of our age, can only promote healthy reflection among mature men."

Feis' Tuesday morning citation, appropriately sandwiched between awards to a distinguished Orientalist and one of the foremost journalists of this century, accentuated his never-ending search for truth, stating in part that "he has sagaciously and tenaciously followed the tell-tale paper-trail from cabinet to cabinet, hounding the elusive hare of historical truth while not blinking at the bitter facts." Unlike many of his fellow scholars, Feis, whose earliest publications were concerned with international economic affairs and American foreign policy, doesn't succumb to the temptation of editorializing, of interpreting facts in the light of pre-conceived theories. He is essentially a top-notch reporter in the groves of academe.

A member of the Class of 1916 at Harvard, where he also received his doctoral degree, Feis has been a member of the faculties at Harvard and the Universities of Kansas and Cincinnati. He accepted his first government post in 1931 in becoming economic adviser to the Department of State, an affiliation that was to continue through 1944. A special consultant to three of the nation's Secretaries of War, starting with Secretary Stimson, he was the American delegation's chief technical adviser for the World Economic and Monetary Conference held in London in 1933 and subsequently held forth as a special adviser to the Conference of American Republics, participating in the three major Latin-American conclaves of the 1930's.

For hoping that his penetrating studies of the recent past may help "reduce the terrors of an ominous but unrevealed future"; for his genuine modesty in accepting the distinctions others are eager to confer; for his rare capacities as a historian and as a human being: he is TOWN TOPICS' nominee for

PRINCETON'S MAN OF THE WEEK

U. OF CHICAGO ENDS HUTCHINS' SYSTEM

Selection of Dean Completes Shift From 2-Year College to Conventional 4 Years

SOME OLD IDEAS REMAIN

But the Institution Pledges a Policy Balancing Brains With Brawn and Beauty

By AUSTIN C. WEHRWEIN

Special to The New York Times.

CHICAGO, May 20—The University of Chicago erased today the last vestige of Dr. Robert M. Hutchins' controversial undergraduate plan. But it clung to some of his basic education theories.

The step was taken as Dr. Lawrence A. Kimpton, who succeeded Dr. Hutchins as Chancellor in 1951, announced the reorganization of the college, the university's undergraduate unit.

Dr. Alan Simpson, a 46-year-old British-born historian who has been at the university for thirteen years, was made dean of the reorganized college, which has 2,200 students.

Dr. Simpson pledged that there would be a place for "beauty and brawn, as well as brains" on the campus.

Can Specialize in College

The new college will no longer be restricted to the two-year "general education" concept that was the keystone of Dr. Hutchins' plan. Dr. Kimpton announced that starting next fall students in the college would be able to pursue their major specialty within the college, instead of transferring in their junior year to a graduate division.

Thus the administrative machinery of the Hutchins plan was totally dismantled. However, Dr. Hutchins' goal of a "broad general undergraduate education" will still be achieved in a more flexible way, according to university officials.

The old college system became so involved that forty separate "peace treaties" were formulated between the college and the various graduate divisions to handle the transfer of college students into their specialties.

Hutchins Made Innovations

Dr. Hutchins, who is now president of the Fund for the Republic, came to the university in 1929 from the deanship of Yale Law School as a 29-year-old "boy wonder."

He engineered a series of radical changes during his twenty-two-year regime. The changes, among other things, made it possible for bright high school pupils to start at the university as freshmen after two years of high school.

The Hutchins plan at its zenith abolished all normal course requirements except the passing of comprehensive examinations for fourteen required general education courses.

In theory these examinations could be taken within two years and led to a bachelor's degree. However, most students needed three-and-one-half years to get through the mandatory courses.

Dr. Hutchins also abolished intercollegiate football and took the university out of the Big Ten Conference.

Dr. Simpson said the best feature of the old system was the spirit of "radical inquiry and enthusiasm" it engendered. But he added:

"We also have asked ourselves if beauty and brawn do not deserve a place on our campus as well as brains. The idea is not to lower our standards, but to attract a greater variety of Americans who are qualified to meet them. The ordinary American boy, who will only make a million in later life, the ordinary girl, who wants a husband as well as a diploma, are as welcome here as the Quiz Kid."

Foe of Complacency

Robert Maynard Hutchins

Man in the News

A GENIUS for shattering the complacent has long been the mark of Dr. Robert Maynard Hutchins. Now 62 years old, he has slowed down somewhat. But yesterday he appeared prepared to stir up things again. As president of the Center for the Study of Democratic Institutions, he announced the center would undertake a two-year study of the moral and ethical attitudes of Americans. The center was set up in 1959 by the Fund for the Republic, of which Dr. Hutchins is president. The fund, in turn, was set up in 1952 by the Ford Foundation as an independent unit.

The fund was given $15,000,000 and told to spend it in support of "activities directed toward the eliminations of restrictions on freedom of thought, inquiry and expression in the U. S., and the development of policies and procedures best adapted to protect these rights."

This directive made it inevitable that the fund would quickly run into trouble, for the late Senator Joseph McCarthy was then in full cry. The fund's projects included an expose of the Federal loyalty security program, studies of "blacklisting" in entertainment and of the nature of communism in the United States, and the degree of its threat to freedoms.

Bears Brunt of Attack

Dr. Hutchins absorbed the brunt of the attack. He was accused by the American Legion of "giving comfort to the enemies of America." Always disdainful of popular reaction, he invited bad publicity by giving $5,000 to a Quaker library in Pennsylvania that had decided not to dismiss a librarian who had refused to say whether she had been a Communist.

Later he hired, as temporary press officer, a man who had refused to tell a Congressional committee whether he had been a party member. Dr. Hutchins said he would not hesitate to hire a Communist so long as the man was qualified for the job and "I was in a position to see that he did it."

Before bursting into philanthropy, Dr. Hutchins was the enfant terrible of American education. For twenty-two years as president and chancellor of the University of Chicago, he kept that campus in ferment with innovations and shocked fellow educators with such statements as "All we can say of American education is that it's a colossal housing project designed to keep young people out of worse places until they can go to work."

Wide World

"The biggest enemy of human progress is mental indolence."

Abolishes Football

Dr. Hutchins abolished football at Chicago. He let students into the university after two years of high school; eliminated compulsory class attendance and course credits; gave bachelor's degrees after two years of study if the student could pass comprehensive examinations.

The college went back to the conventonal four-year undergraduate system in the fall of 1959.

Before Pearl Harbor Dr. Hutchins opposed American participation in World War II, arguing that the country was "morally unprepared." Yet he allowed the university to become the site of important work in the development of the atomic bomb. Under the stands at Stagg Field occured the first controlled chain reaction experiment, on Dec. 2, 1942.

Dr. Hutchins was born in Brooklyn on Jan. 17, 1899, a son of a Presbyterian minister. He served in the United States ambulance corps in World War I.

After the war he entered Yale, receiving a Bachelor of Arts degree in 1921 and a law degree in 1925. He became a professor at Yale Law School in 1927 and the following year—then 28 years old—was appointed dean. In 1929 he was appointed president of the University of Chicago and in 1945 he became chancellor.

Accepts New Post

His old friend, Paul Hoffman, who had been a trustee of the University of Chicago, asked Dr. Hutchins in 1951 to become an associate director of the Ford Foundation. Dr. Hutchins accepted.

In 1954 the Fund for the Republic—which Dr. Hutchins has described as a "wholly disowned subsidiary of the [Ford] Foundation"—called Dr. Hutchins to New York as its president.

On his sixtieth birthday in 1959, Dr. Hutchins said he was still in favor of thought. "The biggest enemy of human progress is mental indolence," he said. "As Aristotle said, 'Learning is accompanied by pain.' Too many people won't go through that pain."

The saying is fairly typical of Dr. Hutchins' intellectual haughtiness, which, with his urbanity and good looks, makes him a living affront to egg-head-haters.

Dr. Hutchins lives in Santa Barbara, Calif., with his wife, the former Mrs. Vesta Sutton Orlick, and her daughter, Barbara, a student at St. John's College in Annapolis, Md. He has three daughters by his first wife, from whom he was divorced in 1948.

THE NEW YORK TIMES, MONDAY, APRIL 17, 1961.

CHARACTER STUDY SET FOR AMERICA

Fund Group Plans 2-Year Appraisal of Citizen Ethics

Dr. Robert M. Hutchins announced yesterday that the Center for the Study of Democratic Institutions would undertake a two-year study of the American character. He is the president of the center, which has its headquarters in Santa Barbara, Calif.

In his annual report to the board of directors of the Fund for the Republic, which established the center in 1959, Dr. Hutchins also disclosed that groups in six foreign countries had expressed their interest in the work of the center.

He said these organizations wished to participate in an international discussion and examination of ways to strengthen free institutions over the world. The six countries were Australia, England, France, West Germany, Greece and Israel.

Dr. Hutchins described the proposed study of the American character as an inquiry into moral and ethical attitudes of citizens. Its purpose will be to reach "dependable conclusions about our national strength and weakness," he wrote.

To carry out its project, the center will ask for assistance from leaders in the professions, in organized religion, education, business and labor. It plans to assemble a hundred of them in a conference in Washington early in June.

Touching on the financial situation of the center and its parent organization, the Fund for the Republic, the report said that at the present rate of expenditures it would take only three or four years to exhaust the original $15,000,000 grant from the Ford Foundation with which the Fund was established in 1952. That grant had shrunk to less than $3,500,000 by last September.

"The most urgent problem of the center is financial," Dr. Hutchins said. "Additional money must be raised."

The Fund for the Republic set up the Center for the Study of Democratic Institutions two years ago, to continue its basic-issues program. That was described as designed to clarify the issues in maintaining a free society in the modern world.

The center now is the fund's main activity. It works as a nonprofit educational enterprise, intended to examine and promote the principles of individual liberty expressed in the Declaration of Independence and the Constitution.

Shift in Moral Climate

"There are signs that the moral character of American society is changing," the announcement of the new study project said. "Why have we placed reliance for our national safety on weapons of mass destruction? Does the plea of the scientist for a larger measure of social responsibility fall on deaf ears?"

Television scandals and exposures of widespread police corruption, Dr. Hutchins said, raised serious questions about the nation's moral attitudes and intellectual commitments.

"Should we be alarmed by the difference between the behavior of Airman Powers in Moscow and of Nathan Hale?" he asked.

"Perhaps we are stronger than the critics of America normally assume," he continued. "Or perhaps they are right, or perhaps we are even in worse condition than they say we are. In any case, we want to start a dialogue between spokesmen of various viewpoints on what the Good Life shall be in America."

Dr. Hutchins announced that among those who will guide the study would be William O. Douglas, Associate Justice of the Supreme Court; the Rev. Dr. Reinhold Niebuhr, Union Theological Seminary; Clark Kerr, University of California; the Rev. John Courtney Murray, S. J., Woodstock College; Eugene Burdick, University of California, and Eric Goldman, Princeton University.

His report also disclosed that Arthur J. Goldberg had resigned from the board of the fund upon his appointment as Secretary of Labor. Three new members of the board were named. They are Louis Schweitzer of New York City, John C. Elliott of Los Angeles, and Alfred E. Heller of Grass Valley, Calif.

Alfred U. Names Physics Head

Special to The New York Times.

ALFRED, N. Y., April 16—Dr. Aaron Sayvetz, Professor of Physical Sciences, University of Chicago, has been named professor and chairman of the Physics Department, College of Liberal Arts, Alfred University. He will take the post in the fall.

THE NEW YORK TIMES, SUNDAY, MAY 24, 1959.

PRINCETON PICKS RESEARCH BOARD

Smyth Heads New Group to Shape Policy on Grants —Gets Rank of Dean

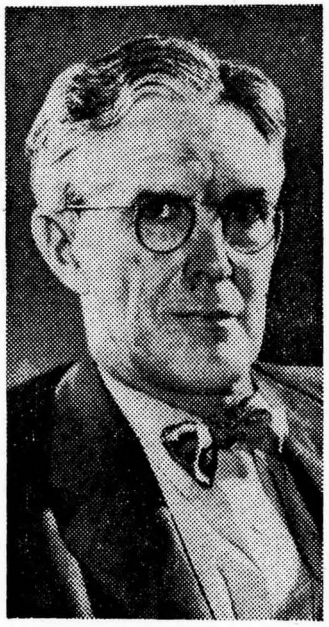
Special to The New York Times.

PRINCETON, N. J., May 23 —A nine-member Princeton University research board has been set up to shape policy in the acceptance and administration of research grants and contracts.

Dr. Robert F. Goheen, president of Princeton, said today that Dr. Henry DeWolf Smyth, a former member of the Atomic Energy Commission and now Joseph Henry Professor of Physics at Princeton, had been appointed chairman of the board. He will have the rank of dean.

The new board, which has representatives of the humanities and social sciences, replaces the twelve-year-old Committee on Project Research and Inventions. It was composed entirely of representatives from the Department of Science and Engineering and handled only research projects related to these fields.

In addition to Dr. Smyth, those on the board include Dr. Carlos Baker, Woodrow Wilson Professor of Literature; Dean Joseph C. Elgin of the School of Engineering; Dr. Donald F. Hornig, chairman of the Department of Chemistry; Dr. Richard A. Lester, Green Professor of Economics; Dr. Arthur K. Parpart, chairman of the Department of Biology; Dr. Joseph Strayer, chairman of the Department of History; Ricardo A. Mestres, financial vice president and treasurer of the university, and Raymond J. Woodrow, the assistant treasurer.



GETS NEW POST: Prof. Henry DeW. Smyth, chairman of the research board at Princeton University.

ROBERT GARRETT, COLLECTOR, DEAD

Retired Banker Gave Noted Arabic Works to Princeton

Special to The New York Times.

BALTIMORE, April 25—Robert Garrett, a retired investment banker, a champion in the Olympic Games of 1896 and a collector of Arabic manuscripts, died today at Sheppard and Enoch Pratt Hospital after a long illness. He was 85 years old.

Mr. Garrett was a trustee of Princeton University, where he graduated in 1897, from 1905 until 1946, when he became a trustee emeritus. In 1942 he presented to the university the collection of Arabic and Middle Eastern manuscripts, the largest and one of the finest existent, that he and his late brother, John W. Garrett, had assembled.

The collection, comprising 11,000 items, ranged from Egyptian papyri to nineteenth-century manuscripts and covered the entire range of Arabic science and philosophy, which flourished while European scholarship was blighted during the Dark Ages.

Among the notable manuscripts are an annotated copy dating from 1176 of a translation of Galen's works on anatomy and medicine by the Syrian Nestorian Joannitus, first made in 873; a copy of "The Rubaiyat of Omar Khayyam" made in Baghdad in 1463, seven years after the earliest known copy and Greek manuscripts that have contributed greatly to knowledge of the origins of Byzantine art.

Mr. Garrett also led the development of public recreational facilities in Baltimore, privately financing with friends many parks and playgrounds. He was the first chairman of the city's Department of Recreation and was first chairman of the combined Department of Recreation and Parks. Mr. Garrett was long active in the National Recreation Association and in 1941 he became its chairman.

Descendant of Banker

Mr. Garrett was a native of Baltimore. In 1840, his great-grandfather, who bore the same name, founded Robert Garrett & Sons, an investment-banking firm that is a member of the New York Stock Exchange, with branches in New York and Hagerstown, Md.

Mr. Garrett was a general partner in the business until 1947, when he became a limited partner. He retired in 1957.

While a junior at Princeton, Mr. Garrett, who was captain of the track team, competed in the Olympic Games at Athens, the first games of the modern era.

He and three Princeton teammates were members of an unofficial United States team of thirteen each of whom paid his own way. Mr. Garrett triumphed in the shot put. He then competed for the first time in the discus throw, and won that as well. He was second in the broad jump and high jump. His performance led the United States to the unofficial team victory.

Mr. Garrett had also served as a member of the board of the Baltimore & Ohio Railroad, the A. S. Abell Company, publisher of the Baltimore Sunpapers, and several banks. He was a former president of the board of trustees of the Walters Art Gallery and a former trustee of the Baltimore Museum of Art.

He is survived by his widow, Mrs. Katherine Barker Johnson, Garrett; two sons, Harrison, a partner in the family firm, and Johnson, Assistant Secretary General of the North Atlantic Treaty Organization; four daughters, Mrs. Katherine Bainbridge, Mrs. Alice Phillips, Mrs. Ella Brigham and Mrs. Barbara Reed, and twelve grandchildren.

The New York Times
APRIL 30, 1961 • SECTION 11

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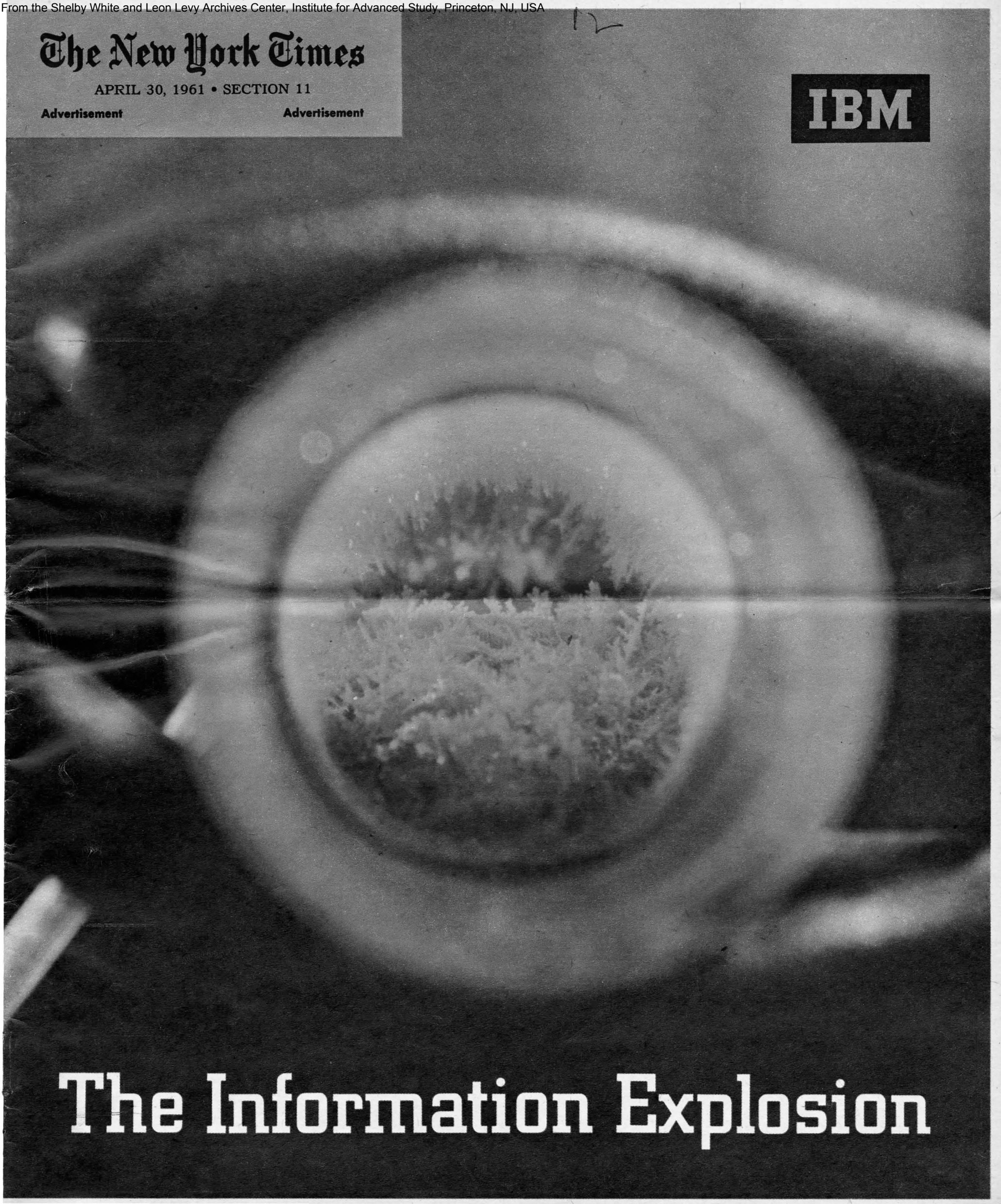
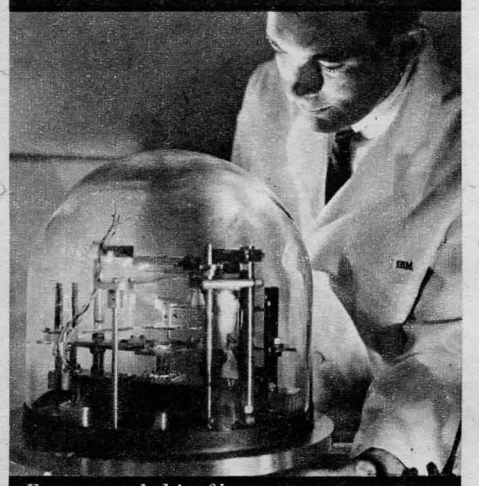
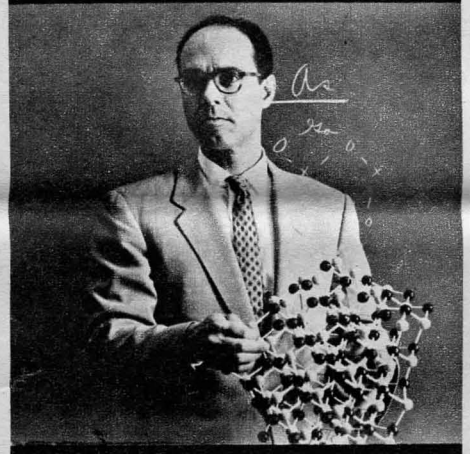


The Information Explosion

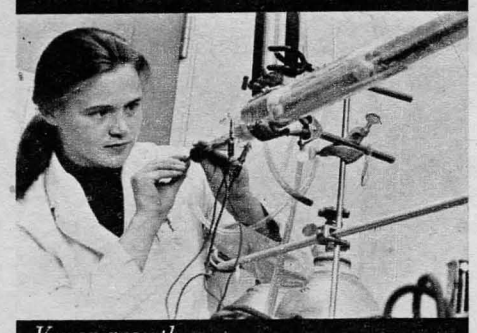
Optical maser



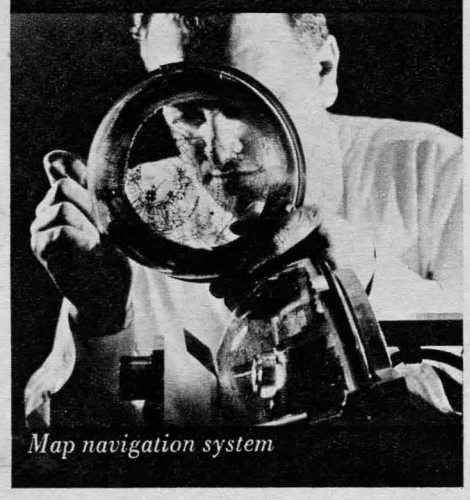
Evaporated thin films



Solid state chemistry



Vapor growth



Map navigation system

New Directions in Computer Technology

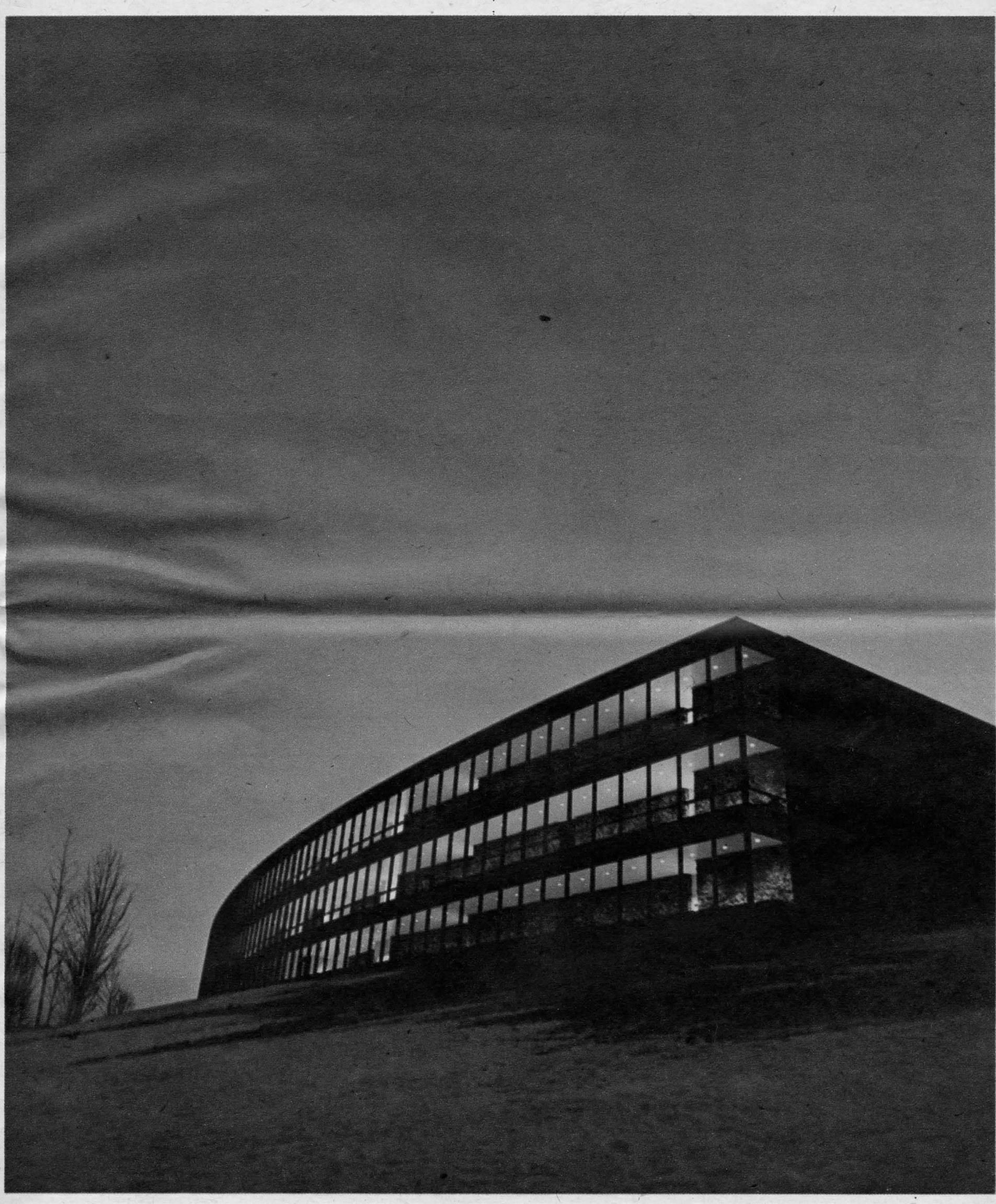
This supplement shows the scope of activities in IBM's new Thomas J. Watson Research Center. The center (pictured opposite) is located at Yorktown Heights, New York.

The cover shows a coral-like cluster of needles and platelets of germanium iodides. These are found in the quartz-tube "furnace" during IBM's vapor growth process, a major advance in solid state physics.

Research Center photograph by Marvin Lichtner
Microphotographs, pages 6 and 8, by Dr. Roman Vishniac

This advertising supplement was prepared by International Business Machines Corporation, 590 Madison Avenue, New York 22, N. Y.

IBM



диненных Штатах появился новый перевод бессмертного романа Л. Н. Толстого «Война и мир». Правда, не всего романа, а лишь нескольких отрывков из него, даже столь немногих, что они занимают всего одну машинописную страницу. Но тем не менее это достижение. Все-таки культура не стоит на месте. Что-то переводят. Что-то печатают. Правда, по мнению некоторых литературных скептиков, перевод сделан довольно «дубово». Но это, как говорится, мнение отдельных злопыхателей. Если же кто сомневается в квалификации переводчика, то поклонники его таланта могут поведать, что он обладает запасом слов, равным 600 тысячам, в то время как Шекспиру приходилось довольствоваться всего лишь какими-то жалкими 24 тысячами слов. Разгорелась дискуссия литературоведов. Представители американского объединения переводчиков, очевидно, из конкурентных соображений, пытались опорочить новую знаменитость. Указывали, в частности, на то, что некоторые специфические русские выражения переведены слишком буквально, без передачи их истинного смысла. С другой стороны, инженеры уверяли,

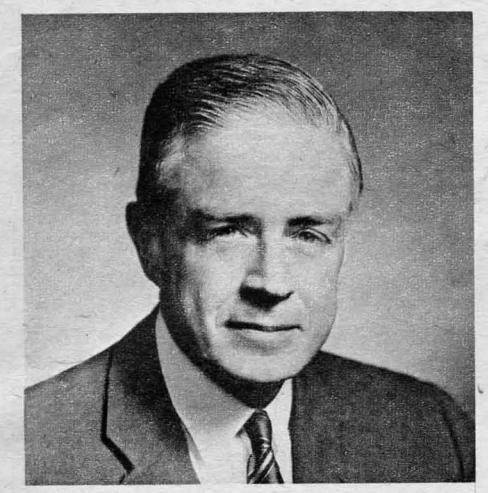
United States appeared new translation immortal novel **L. N. Tolstogo** "War and world/peace". Truth, not all novel, but only several fragments out of it, even so few/little, that they occupy all one typewritten page. But nonetheless this achievement. Nevertheless culture not stands/costs on place. Something translate. Something print.

Truth, by opinion certain literature sceptics, translation made enough/fairly "oak". But this, as they say, opinion separate malignant. If however who doubt in qualification translator, that admirer it/its talent can tell/disclose, that it possess store words, equal 600 thousands, at the time when Shakespeare had to satisfy all only some pitiful 24 thousands words.

Inflamed discussion literature specialists. Representative American unification translators, obviously, out of competition consideration, attempted defame new celebrity. Indicated, in particular, on that, that certain specific Russian expression translated too much literally, without transmission them/their true meaning. On the other hand, engineer assured, that this shortage will be soon after removed and on light/world will be able to appear even written in verse translation.

Reader narrower/already, apparently,

The Information Explosion



by Thomas J. Watson, Jr.
President
International Business Machines Corporation

There never has been a time when more information was available to more people than at the beginning of this promising decade. Not only are more people doing more things that are worth knowing about, but the means for communicating information have never been so effective and far reaching as they are today. With radio and television, jet travel, countless libraries, and a highly articulate press, it is a remote and highly insulated individual who is not exposed to immense quantities of information.

The tremendous material progress that has been made since World War II has been stimulated by our ability to communicate with one another. Although political differences sometimes have hampered a free interchange of information, even in this area there are some signs of improvement.

To those of us in the data processing industry, it is a source of satisfaction that some of the advanced tools we have developed are helping man learn more about his nature and environment. These advances are making available on a broader scale the useful things that man is learning now, that he will learn in the future, and that others have learned in the past.

Computers and data processing systems can do arithmetic and other repetitive tasks at prodigious speeds. They help scientists and engineers, doctors and economists, government agencies and businessmen expand their efforts by taking over much of the wearisome figure and paper work involved in their studies and research or in their daily routines of running businesses and institutions.

Computers can also be adapted to the sorting, storing and retrieval of information found in such places as libraries, Patent Office files, and the vaults of hospitals and health departments. Over the years, the useful information that has been discovered has mounted to a staggering volume. As people become more advanced in their endeavors—for example, developing peaceful uses for atomic energy and discovering remedies for some of the stubborn physical ills—the volume of new knowledge and need to refer to knowledge both new and old are greatly increased.

This accumulation of facts and figures has been called "The Information Explosion." The computer industry is finding the means to control this "explosion" and put its energies to work constructively just as scientists are learning to control nuclear energy. Using powerful computers and accessory equipment such as machines that can read, file, summarize or translate the words on a printed page (and recover them for use when needed), along with data transmission equipment that can circle the globe, man eventually will make vital information accessible to those who can benefit by it. Computers, however, are only the tools of the job. The important and vital factors in this advance are the brilliant men and women who put these tools to work.

We are grateful for the privilege of living and working in this age of excitement and progress. We in IBM are proud to be participating in the development of machines that contribute to knowledge and help make it readily available to all.

World Center of Computer Technology

by Gilbert W. King
Director of Research
International Business Machines Corporation

Computers have been developed to help men find answers to the fantastically complex questions being asked throughout science and industry. Many of these questions could never be answered without the help of the modern computer. The immense time and expense involved in human calculation would simply make the task impossible.

Even the computer, however, must be constantly improved to meet the challenges of new and more demanding questions. The designers must continually look for advances in "the state of the art." Some of these new developments will be in so-called "hardware," such as electronic devices for creating higher-speed arithmetic units, larger, faster memories, and lower-cost logical or decision elements.

Other advances will be conceptual—better ways to organize both computer systems and the problems to be solved with them, new techniques for "instructing" or programming computers, and new ways to evaluate a system's performance without actually building it.

For this reason, the new Thomas J. Watson Research Center carries out broad research programs in the physical sciences, mathematics, the life sciences, and advanced engineering. Many ideas formulated here will flow to IBM development laboratories for possible use in data and information processing systems. In other cases, the ideas are actually fundamental contributions to human knowledge and will find their way into college textbooks for tomorrow's scientists and engineers.

Physical sciences

IBM physicists and chemists are trying to exploit the subtle changes—usually electric or magnetic—that can be brought about in matter by small changes in energy. This, first of all, requires much better fundamental understanding of solid state physics. But it also demands an intensive search for new magnetic and semiconducting materials to improve present solid state devices, such as transistors and diodes, or to develop entirely new types of devices. Promising work is being done with microscopically thin films and crystals grown from the vapor state. Electronic circuits built around these films and crystals consume very little power and should eventually be much more compact, faster and more reliable than circuits in common use today.

"Superconductivity" may also have a great potential in computers. When certain materials are cooled to nearly absolute zero, they no longer offer resistance to an electric current; they become superconductors. If they are placed in a magnetic field, however, resistance reappears. This phenomenon is the basis for a simple switching device called a cryotron, which consumes little power and can be used in a computer both to perform arithmetic and to provide number storage.

Arithmetical and logical functions may also be performed in the future by comparing the phases of very high-frequency waves, such as microwaves. A recent development in IBM is an efficient, low-power light amplifier, or "maser," which puts even a so-called optical computer within the realm of possibility.

Mathematics

A large part of the work in mathematics at IBM is done in direct support of the work in the physical sciences, where new effects being investigated frequently require new mathematical descriptions. Since computers can handle numbers—add, subtract, multiply and divide—at enormously high speeds, it is important to find numerical—as opposed to analytical—methods for solving problems. Little has been added to ways of solving problems numerically since the great contributions of the famous mathematician, Karl Gauss, in the middle of the last century. But the capabilities of the computer may well stimulate new methods to surpass the achievements of the past.

The design of a computer is a challenging mathematical problem in itself. Thousands of independent circuits must be strung together to provide the required information paths. In most cases the designer's intuition is far from adequate to choose the best, or most economical, combination. IBM's mathematicians have

Language translation

Machine translation of Russian into rough but meaningful English is possible with IBM's Mark II translator developed jointly with the U. S. Air Force.

written computer programs to design "optimum" circuit networks, thereby contributing significantly to equipment cost reduction and reliability.

Programming research

Popular articles to the contrary, computers are really not "thinking machines." They must be instructed. Just as a child must be painstakingly taught to tie his shoelaces, a computer must be told exhaustively just what to do and exactly how to do it. The art of instructing computers is called programming.

In practice, the programmer breaks down the statement of the problem into steps, or instructions, upon which a computer can act. The difficulty is that computer language, since it reflects the circuits in the processing units, is fragmentary and awkward. Programming research aims at making a more convenient language available by developing an intermediate program, or compiler, to translate this language automatically into machine language.

A major step toward simplifying the handling of scientific problems was taken with the IBM FORTRAN Automatic Programming System, first made available for use in 1957. An extension of FORTRAN presently under study at the Research Center will simplify the programmer's task even further.

Engineering sciences

Much is being done to discover principles which will ultimately permit discarding conventional electromechanical methods of getting information into and out of computers. A series of experiments was recently performed to demonstrate the feasibility of scanning graphic information electronically and delivering it to the arithmetic processing units in numerical form at very high speeds. These same techniques could be used for displaying output information in graphic form or for ultra-high-speed printing.

Scientists are also trying to gain a more fundamental grasp of the factors involved in automatic character and speech recognition by machines. Although partial solutions exist, the theories and methods that will make truly flexible systems possible are not yet entirely in hand. A number of original contributions have come from the Research Center. One theory involves the use of entropy, or degree of organization, to classify signal patterns. Another involves using mathematical transforms of the input signal to be correlated with stored models of the characters which are to be recognized.

The units within the central processor itself are as varied in their types of functions, speeds, and signal levels as are the peripheral, or input-output units. Coordinating all these activities to achieve efficient operation has become so complex as to generate a whole new body of theory —the theory of computer organization.

Studies indicate that the fundamental potential of computers has scarcely been tapped. For example, concepts are being formulated to enable computers to attend to several tasks at once or to permit several computers to cooperate on a single task. Much more sophisticated (associative) techniques for selecting data from a file are being evolved. Coding schemes are being devised which will make operation error-free—even at contemplated future cycle times of billionths of a second, where signal detection becomes very difficult.

Life sciences

Computers are but one part of a complex man-machine system for solving man's problems. How man can best communicate with machines—or how machines should be designed for easy use—is the main goal of the research program in psychology.

Quite a different approach in the life sciences is the study of living nervous systems to see how they differ from machines in processing information. Because of its simplicity, the crayfish has been a valuable subject for experiment. Thus far little has been learned that can be applied to computer technology, although the computer has aided biologists considerably in understanding the crayfish.

Experimental systems

It would be premature to set any limits on the number and variety of jobs that computers may one day perform. Their potential usefulness goes far beyond high-speed arithmetic. Two areas where computers show great promise are language translation and information retrieval.

IBM has developed, jointly with the U. S. Air Force, a language-translation system that produces a very readable English translation of Russian text. The system combines a special computer with a new type of storage device, consisting of photographic disks ten inches in diameter that can be scanned at high speed. On these disks are stored the equivalent of a good-sized Russian-English dictionary, together with a table of lexical and syntactical indicators for resolving ambiguities and seeing to it that words are translated meaningfully. Actual translation is in a series of stages, involving repeated consultation of the "dictionary" and table of rules.

The second area of promise, information retrieval, bears certain resemblances to language translation. In both cases it is necessary to deal with words and their multiple meanings. Information retrieval has come to mean the use of machines to index and file large amounts of information—anything from business records and correspondence to whole technical libraries—and to retrieve, on command, any piece of pertinent information in the file.

In principle, it would be possible to record the contents of an entire library on magnetic tape and to search the whole tape (consisting of dozens or hundreds of reels) in answering every request for information. This approach, however, would cost too much and be too slow.

An alternative method is to file brief abstracts of records, articles, or books, and confine the search to these. The key problems are to produce brief, yet comprehensive abstracts and file them in such a way that they can be searched rapidly and effectively. Systems that could solve these difficult problems would help society master the explosive increase in information referred to by Professor Toynbee in his article on page twelve.

Research locations

In addition to housing its own program, the new Research Center will serve as a focal point for IBM research activities throughout the world. Other research locations are: the Watson Scientific Computing Laboratory adjacent to the Columbia University campus in New York City, the San Jose Research Laboratory in California, and the Zurich Research Laboratory in Switzerland. These widespread facilities give IBM a familiarity with currents of thought here and abroad which could not be gained otherwise.

The research program at IBM helps to keep the corporation alert to trends and changes which may affect its products or services. Through its success IBM's products, today and in the future, will contribute more to the steady progress of the business community and nation.

Science and Industrial Research

by E. R. Piore
Vice President, Research and Engineering
International Business Machines Corporation

The most significant change within industry and government over the last twenty-five years has been the discovery that science is important. To young people whose lives exactly span this quarter century, this statement may not carry much conviction. After all, they have been hearing of jet planes and atomic energy since they were eight or nine years old and living in the space age ever since they were able to vote. They may find it hard to believe that science was not always so highly esteemed, either by businessmen or by political leaders, as it is today.

It may help, therefore, to recall some figures. In 1936 the U.S. government spent less than $40 million in support of science and technology. There was no National Science Foundation and no Atomic Energy Commission.

In fiscal year 1961, the United States government will spend more than $8 *billion* on research and development. Over the same period, 1936-1961, American industry has similarly raised its annual research investment—from less than $200 million to more than $5 billion.

Dollars invested in science and technology tell only part of the story. If we could measure the changes in social and cultural attitudes, the differences between 1936 and 1961 would be equally profound. In 1936 only the chemical industry had much demand for Ph.D.'s. The goal of the great majority of Ph.D.'s in fields other than chemistry was to teach in a college or university; in fact, they had little other choice. With few exceptions, Ph.D.'s regarded a job in an industrial or government laboratory as second-class employment. In all industry in the 1930's there were scarcely half a dozen research organizations that commanded respect in the academic community; each had room for perhaps five or six new Ph.D.'s in physics each year.

This year, to speak only of physics, government and industry may employ 300 new Ph.D.'s. In addition, there will be many openings for chemists, mathematicians, biologists, psychologists, and astronomers. No longer is there a stigma attached to industrial and government employment. In many cases it is hard to draw a line between federal and private, or between federal and academic sponsorship of research. Increasingly, scientists have come to feel equally at home in universities, in government, or in industry. This, I believe, is the most significant change that has happened in the scientific community in my lifetime. Industrial laboratories have become a major intellectual and cultural force in Western society.

Tunnel diode

Shown here magnified several thousand times is a tunnel diode, one of the new semiconductor devices being developed to advance computer technology.

Industry has earned its new status. It has demonstrated that in areas where it has paramount interests—for example, in electronics, information handling, aerodynamics, pharmaceutical chemistry, polymer synthesis—it is ready to support work of the same fundamental type as that conducted in universities. In the best of the industrial laboratories many men are motivated by the same type of intellectual curiosity, the same drive to understand the world about them, as were formerly found only in the academic community.

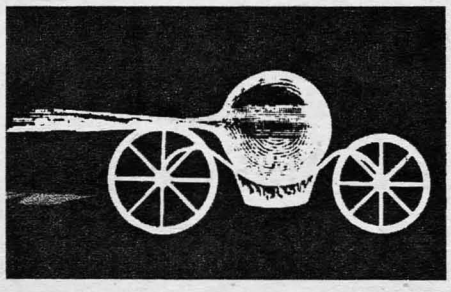
I am not saying that the two communities, the industrial and the academic, are now indistinguishable. Of course they are not. Universities still have the unique responsibility of training young minds, of transmitting knowledge from generation to generation. University teachers, as research scientists, have the responsibility of inquiring freely into nature, of examining nature in all its diversity, without regard to practical value or benefit. The university must also ensure that all scientific ideas and hypotheses have an equal opportunity in the intellectual market place.

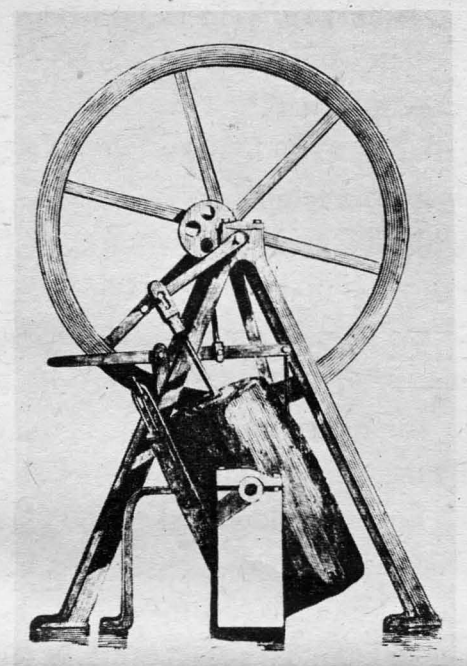
The industrial laboratory has a much narrower role, but a role that has become one of the most dynamic in our whole industrial economy. The basic responsibility of industrial research, in the last analysis, is to meet or create a market for products or services. In a manufacturing company, technical achievements are almost always an important factor in fulfilling this responsibility. As competition has become more intense it has forced industry to become steadily more expert in understanding the laws of nature. These laws both forbid and permit. For example, they prevent anyone from building perpetual-motion machines, though in a more innocent era countless inventors tried to build them and even won patents on their designs.

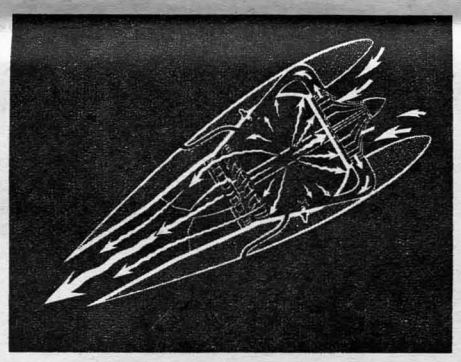
In modern research we are more apt to be impressed by the range of things that nature will permit us to do. The problem is first of all to do it—and then at an acceptable cost. We have known since December, 1942, how to release nuclear energy from uranium fission; we have not yet learned to make nuclear energy generally competitive with energy from fossil fuels. It appears that we will eventually obtain energy from controlled thermonuclear reactions, but this energy will also have to be competitive if it is to be very useful.

The great lesson of the last few decades is that major technological advances are impossible without a deep understanding of nature. It is often said that nylon is made from coal, air, and water. One can imagine the frustration of even the greatest nineteenth-century chemist if he were given these three substances and offered a prize if he could turn them into nylon. To make the first nylon, Wallace Carothers, the great Du Pont chemist, had to build on all the available knowledge of chemical structure acquired by generations of his predecessors. To this knowledge he added his own sharp and unique insights. After Carothers had shown the way, other chemists were able to create synthetic fibers by the hundreds.

Early "industrial research" looked for new sources of power and new ways of applying it. Pictured below are Isaac Newton's and Robert Fulton's engine designs.







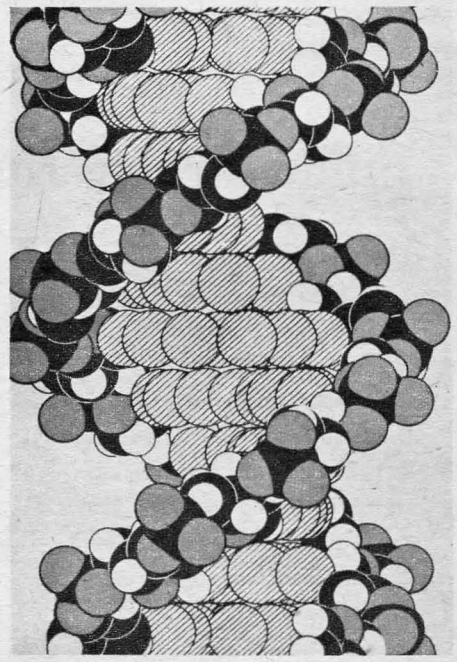
Today's industrial research in jets (pictured above) and nuclear submarines continues the tradition.

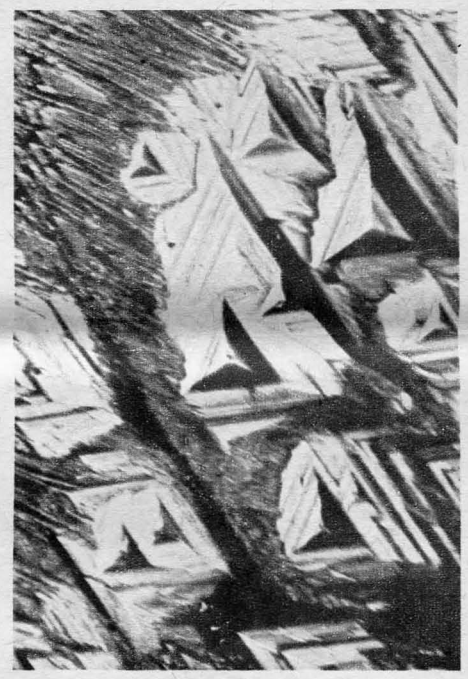
The transistor provides another spectacular example of a great discovery flowing from deep understanding. A transistor can be made from something as simple as germanium, a rather common element, and an infinitesimal pinch of arsenic or similar substance. The whole trick is to process and fabricate the raw materials in precisely the right way. This requires a thorough grasp of quantum mechanics and how it can be used to predict the behavior of matter in the solid state. Immediately after World War II a number of physicists, academic as well as industrial, believed that it might be possible to build a solid state device able to duplicate the function of the vacuum tube. The first men to succeed were John Bardeen and Walter Brattain, working at Bell Telephone Laboratories. In 1956, Bardeen and Brattain, together with their colleague William Shockley, were awarded the Nobel Prize in physics for discovering the principle of the transistor. Last year U.S. companies produced over 128 million transistors, valued at more than $300,000,000.

Nylon and the transistor epitomize industrial research operating at its highest level. Both required corporate sponsors who were willing and able to back first-rate scientists with no guarantee that their abstruse research would ever lead to a profit. And in both cases the invention was only the beginning of a long and costly effort. To develop manufacturing processes and to bring nylon to market took Du Pont eleven years and over $25 million. After the invention of the transistor in 1948, Bell Laboratories spent many millions of dollars on engineering development before Western Electric was ready to begin mass production of transistors in 1956.

One must be careful, however, not to draw the wrong lesson from such developments as nylon and the transistor. They are not a tribute to a peculiar American genius. Rather they are practical and tangible rewards for applying new knowledge conscientiously—in short, for doing one's homework. Other nations can do and are doing the same. As C. P. Snow, the British novelist and scientist, observes in his highly esteemed little book, *The Two Cultures and the Scientific Revolution:* "Technology is rather easy. Or more exactly, technology is the branch of human experience that people can learn with predictable results." To be sure, Sir Charles is using technology here to mean something less difficult than creating nylon or a transistor, but I feel sure he would be willing to extend his observation to embrace these developments as well. Three years ago, to cite a case in point, a Japanese physicist, Leo Esaki, invented a solid state device known as the tunnel diode. Even smaller and faster-acting than the transistor, it is now undergoing intensive development in half a dozen countries, including the U.S., and its future looks bright indeed.

Both university and industrial researchers study the structure of the DNA molecule, possible key to heredity in man.





Physicists are now "growing" semiconductor devices to their own specifications.

Science is important to industry and to government because we are trying to exploit nature in ways that are more and more subtle. The future is exciting because more and more minds all over the world are applying themselves to the task. One may hope that in this international rivalry, in a world-wide effort to understand nature ever more deeply and to exploit it for human benefit, we may ultimately find a substitute for the strident and dangerous rivalries that afflict the world today.

Cryogenic circuit

Circuits such as the one pictured are used to study the high-frequency behavior and switching characteristics of thin superconducting films.

Hindu-Arabic Numerals: The Language of Mathematics

Our ten basic numbers have proved to be one of the foundations of our civilization. With these mere digits, ingenious mathematical systems have been formulated to probe the mysteries of the universe. Numbers, in a very real sense, are keys to unlock the still waiting secrets of the world we live in.

Twenty-two hundred years ago, from the Hindu Kush to the River Ganges, mighty King Asoka posted his edicts on pillars across India. These edicts contained the earliest known ancestors of the numerals which we use today.

During the early centuries, King Asoka's crude symbols changed to shapes more familiar to us. More important, at some point in early Hindu history, numerals were arranged in a *place system*—and given characteristics that have won them world-wide acceptance.

For it is the place system that makes the Hindu number scheme so compact, so easily learned and above all . . . so simple to use. The system was built around the base ten. (The base could have been any number: the Hindus probably chose ten because they counted on their fingers.) Individual symbols are needed only for 0, 1, . . . , 9.

In contrast, the Greeks without a place system, had to memorize 27 different symbols just for the numbers 1 to 999. Thus, each 8 in 888 was different: Omega (800) Pi (80) Eta (8), and many number relationships were obscured. While the Romans used few symbols, they had to keep repeating them: 888 was DCCCLXXXVIII —twelve symbols. In both these ancient systems multiplication and division were so difficult that they were done on the abacus.

The Hindu numerals with their place system were carried westward to Bagdad by merchants and scholars. There their virtues were expounded in 825 A.D. by a learned Arab, al-Khowarizmi. Trade and war alike brought the Arabs in close contact with the western world. By the 10th century the new numerals had reached Spain and eventually, al-Khowarizmi's book was translated into Latin.

Yet with all their advantages, the new numerals took centuries to win Europe. They were scorned as pagan, sometimes banned as too easily forged—one stroke could turn 0 into 6 or 9. Scarcity of writing materials kept the abacus in use. It was not until the late 15th century that the Hindu-Arabic numerals prevailed and were carried everywhere in inexpensive printed books. At last anyone could learn to use numbers—and the door was open to modern mathematics.

In the Picture: At the top is a reverse print and a reproduction of a drawing from a 17th century manuscript of the *Lilavati,* a work on arithmetic and algebra originally by famous Indian mathematician Bhaskara the Learned (c. 1150). Hindu numbers from which our own evolved can be seen used in an early table. The manuscript is at the University of Pennsylvania. The individual pieces of lead type lined up below were first used in a book by Cardinal Bembo, "De Aetna," printed in 1495.

Ten gifts from ancient India:

Hindu scholars of nearly two thousand years ago gave us ten servants we all use: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. With only these 10 symbols and the place system that came with them, we can express any number, no matter how large or how small it may be.

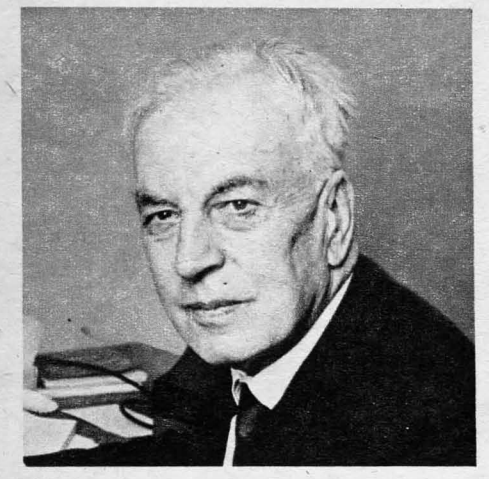
Arabian mathematicians learned these numbers from Indian sages, and brought them to Europe in the tenth century. As Western merchants and scholars found out how much easier it was to multiply 217 by 29 than to multiply CCXVII by XXIX•, the old Roman numerals were gradually abandoned.

However, the shape of the new numerals, hand-copied repeatedly by Medieval scribes, varied widely until the coming of the printing press in the fifteenth century. Then inexpensive printed books made the mathematical classics as well as the new commercial arithmetics available throughout the length and breadth of Europe—and fixed the numerals in type styles still used today. Simple enough for a grocery bill, so adaptable they can describe the basic laws of the universe, these ancient numerals are woven into the fabric of our lives.

•MMMMMMCCXCIII or 6,293

The Gulf of Ignorance: Can Computers Help Bridge It?

by Arnold Toynbee



All human thought takes place in some single human mind. There is no other place where it can occur. "Collective" thought, feeling and action are nonexistent. We talk in terms of collective activity all the time. We are driven into using this fairy-tale language by the poverty of our powers of conception and expression.

This myth of collective activity may have been indispensable so far, but it is nonetheless misleading. The only real actions, feelings, and thoughts are those of individual human beings; and a human personality's capacity is finite. The maximum intellectual power of a human mind has not been increasing, so far as we know. Aristotle's, Copernicus', and the Buddha's intellectual power were apparently as great as those of any modern thinker. Indeed, man's earliest tools and ideas have been the greatest achievements of human genius so far. All modern technology and science have been built on these prehistoric foundations.

It is true that there has been a lengthening of the average expectation of life in some Western countries during the last two hundred years and in most other countries, too, within our own lifetime. In consequence, the average effective length of adult intellectual life has been somewhat increased. But this increase in the average length of time at a human mind's disposal for learning is negligible by comparison with the recent increase in the quantity of information that a human mind could and should master if it had the necessary time and strength.

Accumulation of information

Thus, in the modern age, the gulf of ignorance has been rapidly widening—not because the human mind's capacity for acquiring knowledge has diminished, but because the quantity of things to be known has increased—and increased enormously. Can this rapidly widening gulf of ignorance be bridged by a rapidly improving technology? Can computing machines come to the rescue of human minds that are in danger of being drowned in an ocean of information?

Why has the quantity of information at our disposal, if we could handle it, been increasing? We have just noticed the recent lengthening of average life expectation thanks to preventive medicine and public health services. This has been reducing the death rate without any pro-rata reduction in the birth rate. The consequence has been an explosive increase in population, and a consequence of that has been an explosive increase in communications, for man is a social creature.

Communication may leave no trace. A conversation, whether direct or over the telephone, will be lost if it is not recorded. But in our time a dozen new means of recording have been invented to supplement or replace handwriting and print. We now have typing with carbon copies, mimeographing, microfilming and tape-recording of radio talks and TV appearances. Probably we are only at the beginning of this new series of recording and communicating devices; and already we are keeping a record of a far larger portion than ever before of a total of human utterances which is greatly increasing in volume.

It would take an atomic world war to reduce this accumulating mass of stored information to the dimensions of those fragmentary records that have come down to us from the less recent past. Meanwhile, the increase in the output of documentation is fantastic. In Britain, for example, the number of cubic feet of official documents produced during the Second World War and not destroyed by "conventional" (i.e. pre-atomic) air bombardment is said to have been greater than the number of cubic feet of surviving documents from the whole previous history of the kingdoms of England and Scotland.

New dimensions

Nor can any of us nowadays limit his concern to becoming acquainted with documents produced in one country. We are now moving out of parochial life into "One World;" and, the nearer the world approaches unity, the less possible it becomes for any of us to ignore the available information about other countries, civilizations, races, and religions. Moreover, to know an individual and a community effectively, one must also know their history, since man is a swimmer in the stream of time. This is a formidable requirement, since our stored information about history is already vast, and is increasing in quantity at both ends. At the present end, it is increasing as each moment recedes into the recorded past and a new present arises out of what, a moment ago, was the nonexistent future. At the past end, historical information is being increased by the marvelous work of our archaeologists in disinterring material records of ancient civilizations.

Finally, a new dimension of information has been opened up to us by the new science of psychology. The expanding universe of relations between myriads of human beings is matched in scale by another expanding universe—the universe within the psyche of each single human personality. When we multiply our store of social information by our store of psychological information, the product is virtually infinity. What are we to do with this overwhelming quantity of information?

The first answer we may be tempted to give is: "Let us get rid of it by not paying attention to it." This is the solution that all but a fraction of the world's newspapers offer to their readers. But it is obvious that we cannot afford to ignore each other in the Atomic Age. The invention of atomic weapons has now faced us with the choice of destroying ourselves or learning to live together. And we cannot get on together without knowing each other. Thus, in the Atomic Age, the information explosion may be our salvation. But, if we are to turn this pullulating information to account, we must discover how to master it. We cannot afford to flinch from this problem, no matter how formidable it may be.

"Collective" action

At first sight, it may look as if we were the first generation in history to be confronted by this problem. In past ages, was it not possible for a high-powered single mind to know virtually everything that there was to be known in that mind's time and place? In our Western World, for instance, was not practical omniscience, in terms of available knowledge, achieved by Bede in the eighth century, Dante in the thirteenth century, and Leibnitz in the seventeenth century? But was this apparent omniscience a reality? Or was it an illusion even when the quantity of available information was minute compared with the amount at our disposal now?

Let us recall the fundamental point that "collective" action is fiction, not fact. Why, then, do we talk in terms of "collective" action? "Collective" results are much less difficult to discern and to describe than the individual acts by which they are generated. The individual acts in question are innumerable, and the network of relations between them is immensely complex. Even where only few individuals are involved, it is quite impossible for an unaided human mind to perceive the relation between the "collective" result and the acts of large numbers of individuals that were the only genuine realities in the event. This is beyond the capacity of the most powerful mind—even if it has been highly trained both in mathematics and in the humanities.

Since imperfect knowledge and understanding are better than none at all, we make statements in which we paper over our ignorance with specious labels. Consider the following: "In June 1940 the British decided to go on fighting;" "In the fall of 1956, the British, French, and Israelis committed aggression against Egypt."

It is obvious that an unaided mind cannot grasp what really happened on these occasions. What really happened was a vast number of individual acts, every one different from every other. This ignorance of the relation between "collective" results and the underlying individual human acts is not an ignorance peculiar to us in our time. All human beings who have ever lived so far—Leibnitz, Dante, Bede, Aristotle and the rest—have been as ignorant as we are on this point.

Will technology help?

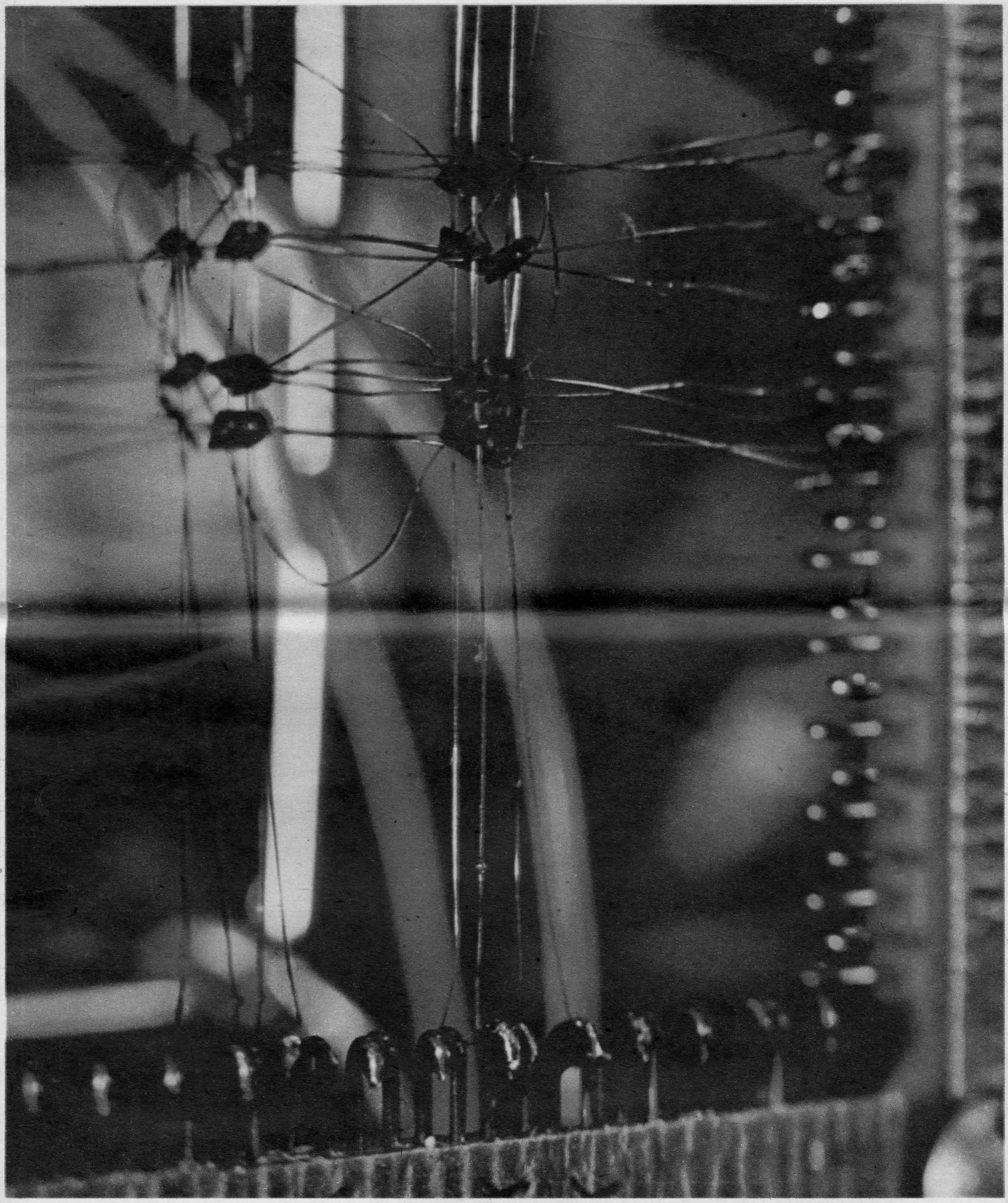
Can technology come to our aid here? Can technology enable us to devise and construct computing machines that will record the myriad acts of myriads of individuals, including the inner acts in the psyche of each individual, as well as the interactions of each individual with every other? And could such a record be utilized by other computing machines for demonstrating in detail, point by point, exactly how these individual acts generated the "collective" results visible to an unaided mind? If computing machines can perform these two operations for us, our insight into human nature and life would be increased out of all recognition. And this gain in insight might be of priceless value to the human race. It might help us to survive the advent of the Atomic Age.

Can any computing machines, existing or foreseeable, perform these prodigies of computatio for us? Here I am quite out of my depth. I do not know what can be expected of computing machines and what can not. My picture of a machine is like my picture of a jinn in some Arab fairy-tale. The jinn can execute a human being's orders on a gigantic scale and can do this in a trice. He can arrive instantaneously at the answers to questions that an unaided human mind could not work out in a single working lifetime.

But, in these mental operations, has the jinn the capacity to take the initiative? Must he not first have been given orders or asked questions by some human mind moving under its own steam? If some human mind has to put the giant computing machine to work, the crucial stage in the operation will still have to be carried out by unaided human intuition. Some mind will have to divine what is the right question to put and what is the right order to give; and some mind will still have to interpret the machine's findings. On these terms of trade between machine and mind, should we find ourselves miles further on than we are today, or should we find ourselves still more or less where we are? I just do not know, so I shall look forward expectantly to the future findings of research on this crucial question. If the gulf of ignorance can be narrowed by man's mechanical genius, this will be good news for humanity.

Experimental memory

Picture opposite shows the magnetic core components of an experimental memory which will store celestial observations made by space vehicles for relay to earth.



New Ways Computers Serve Man

It is now clear, in retrospect, that the electronic computer has been the technological "dark horse" of the last two decades.

If, barely 15 years ago, someone had asked a group of well-informed scientists and engineers to predict which of the developments in their fields would have the greatest impact on business and industrial life by 1961, it is doubtful that the computer would have ranked high on many lists. The glamour of the day was attached to the technological achievements of World War II—atomic energy, radar, jet propulsion, and rocketry.

IBM's first large-scale electronic system—the Selective Sequence Electronic Calculator—went to work in January, 1948. As recently as 1950 even computer enthusiasts were not especially bullish about the demand for their product. A typical forecast of the time was that perhaps fifty large electronic computers would meet all the computing needs of the defense program, the largest government bureaus, and a few of the very largest insurance and industrial firms. Yet the fact was that IBM's S.S.E.C. was in the vanguard of what the *New York Times* reported thirteen years later had become the nation's newest billion-dollar industry—electronic data processing.

Influence of the computer

In the last fifteen years electronic computers have influenced the lives of all of us in hundreds of ways. Every day they handle millions of pay checks, bank accounts, and insurance policies.

But they go far beyond these applications, though perhaps less evidently, to influence the design of almost every product of advanced technology: jet aircraft, nuclear reactors, power plants, oil and chemical plants, automobiles, and bridges. Computers point out to management the critical decisions which must be made in production, at the same time making the routine decisions themselves.

- In a day's time a computer has assembled 16,000 alternative designs for a chemical plant and has selected the best one. Result: a plant of unparalleled efficiency at a saving of half a million dollars as compared with more conventional design methods.
- Computers are keeping track of thousands of ships in the Atlantic and Pacific Oceans so that the Coast Guard can rush help instantly if one of them is in distress. Ship positions are stored on the machines' random access disk files, enabling Coast Guardsmen to select the vessels nearest an emergency without diverting other shipping unnecessarily.
- A computer is rapidly translating English text into Braille in order to speed the production of reading material for the blind and alleviate a critical shortage of Braille translators.
- A computer has been programmed to help physicians diagnose which of their patients are susceptible to heart disease.
- At NASA's George C. Marshall Space Flight Center in Huntsville, Alabama, two powerful IBM 7090's, each capable of adding nearly 14 million figures a minute, are helping to design the huge Saturn space vehicle. Saturn, destined for flights around the moon and deep into space, will be "flown" thousands of times on computers before it reaches the launching pad.

Technology and more

A part of today's broad computer usage can be accounted for by the fact that perhaps no other technological product in history has evolved so tremendously in so brief a period. Every one of its components has been designed and redesigned scores of times—often with the help of another computer. The basic circuitry, which once filled whole rooms, has been made far more compact, faster, and more reliable. The key to this has been the development of solid state components—transistors, diodes, and other devices—that replace vacuum tubes.

Early computers were considered marvels if they had internal storage capacity for 1,000 digits. New machines routinely store the equivalent of more than 320,000 decimal digits. And IBM's STRETCH, the most powerful computer in the world, provides internal storage for more than one and a half million digits, each available on command in little more than 2 millionths of a second.

Systems such as STRETCH have been developed because of the immense complexity of problems confronting science today. This system—and other computers yet to come—will be used in technical areas unheard of fifteen years ago and will bring a new breadth as well to the analysis by business of its own activities.

But a factor other than machine development has widened the use of the electronic computer. It is one which is not wired into a magnetic core plane or measured in microseconds. It is human ideas—generated by the human brain and implemented by the human will to do things more effectively. For man today has begun to grasp the full potential of what he can do with the computer.

In the past year it has been evident that the computer is moving beyond its historic record-keeping role. More and more it is being used by business to help management plan and control; by science to delve into new areas of analysis.

Communication by computer

Recently, the computer's usefulness has been extended still further by a combination of new concepts and new equipment permitting swift transmission of information between data processing installations. The concept calls for a central computer to process data gathered at remote points. The equipment makes possible the exchange of data between computers in the form of punched cards, magnetic tape, or even directly between the magnetic core memories of two computers. IBM's name for this development: TELE-PROCESSING systems.

The significance of such systems to data processing techniques is enormous. Information may be communicated, for remote processing, over leased telephone or telegraph lines or over microwave circuits. The recent addition of dial telephone lines as a means of communicating data adds tremendous breadth to this concept.

It brings computing technology close to the point where virtually every dial telephone may carry a sign saying, "Machine language spoken here." Computer-based data communications systems are, in fact, probably the fastest-growing development in the computer field today.

What form do they take? What do they accomplish? For an airline, an IBM TELE-PROCESSING system will provide a vast computer network to control millions of reservations every year. For a West Coast aircraft manufacturer, it provides a complex of six powerful computers shuttling information back and forth across the Santa Monica mountains, helping to cut the cost of rocket engine development and keeping a balanced work load among the computers.

Information retrieval

But computers have become more than a means by which day-to-day business is accelerated. They also offer a means for managing and making accessible man's growing store of knowledge. The accumulation of scientific and engineering publications prepared throughout the world is growing at a tremendous rate; it is estimated to double every eight to ten years. The ability of a computer to retain facts in memory and to provide instant access to them has given rise to a vital new field: information retrieval.

In Washington, an electronic "law library" locates legal information stored on computer tapes in record time, printing out on request the full text of state laws which involve health and hospitals.

In the social sciences and in literature, the same principle is being utilized. A powerful IBM computer has derived concordances and analytical indices of the Dead Sea Scrolls and the writings of St. Thomas Aquinas and Matthew Arnold, giving scholars new insights into these great works of history.

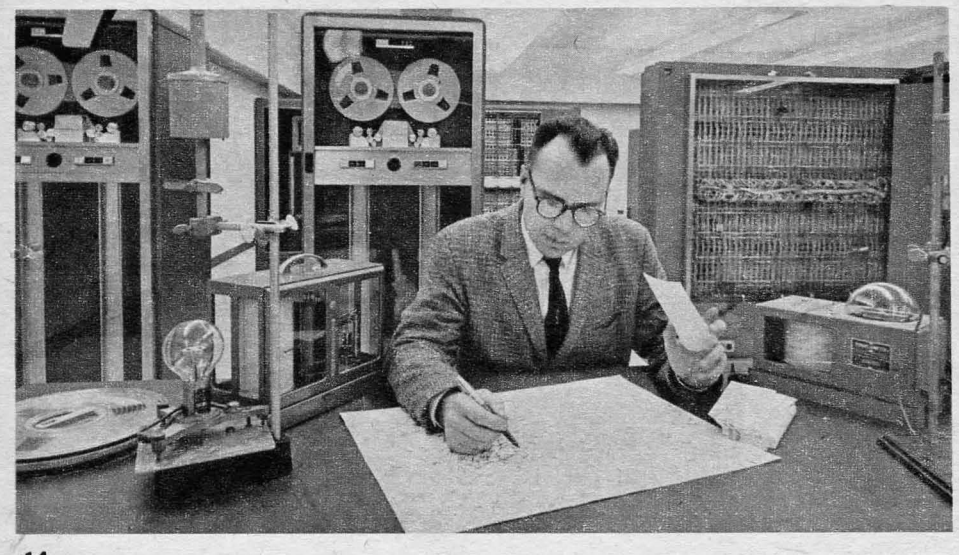
An Air Force information retrieval system has in its files the scientific and technical specialties of thousands of scientists and engineers. When a problem needing quick solution arises, a computer searches the file and identifies a small list of experts who are most likely to provide the answer needed. Here the end product is not a document, but current knowledge which might not even be in print.

In medical research, where the physical, biological and chemical disciplines are merging ever more closely, computers are assuming increasing importance. They are providing the tool for analyzing the interplay of complex variables, once considered separately and piecemeal, to develop new patterns of diagnosis and new depths of understanding.

How will the computer serve man tomorrow? It will help to control the operation of a huge industrial complex. It will be guiding a mighty space vehicle it has helped to design. It will be simulating air traffic patterns to guide supersonic airliners safely through the skies. But however the computer serves man, he can always take pride in the fact that it is a product of his own ingenuity.

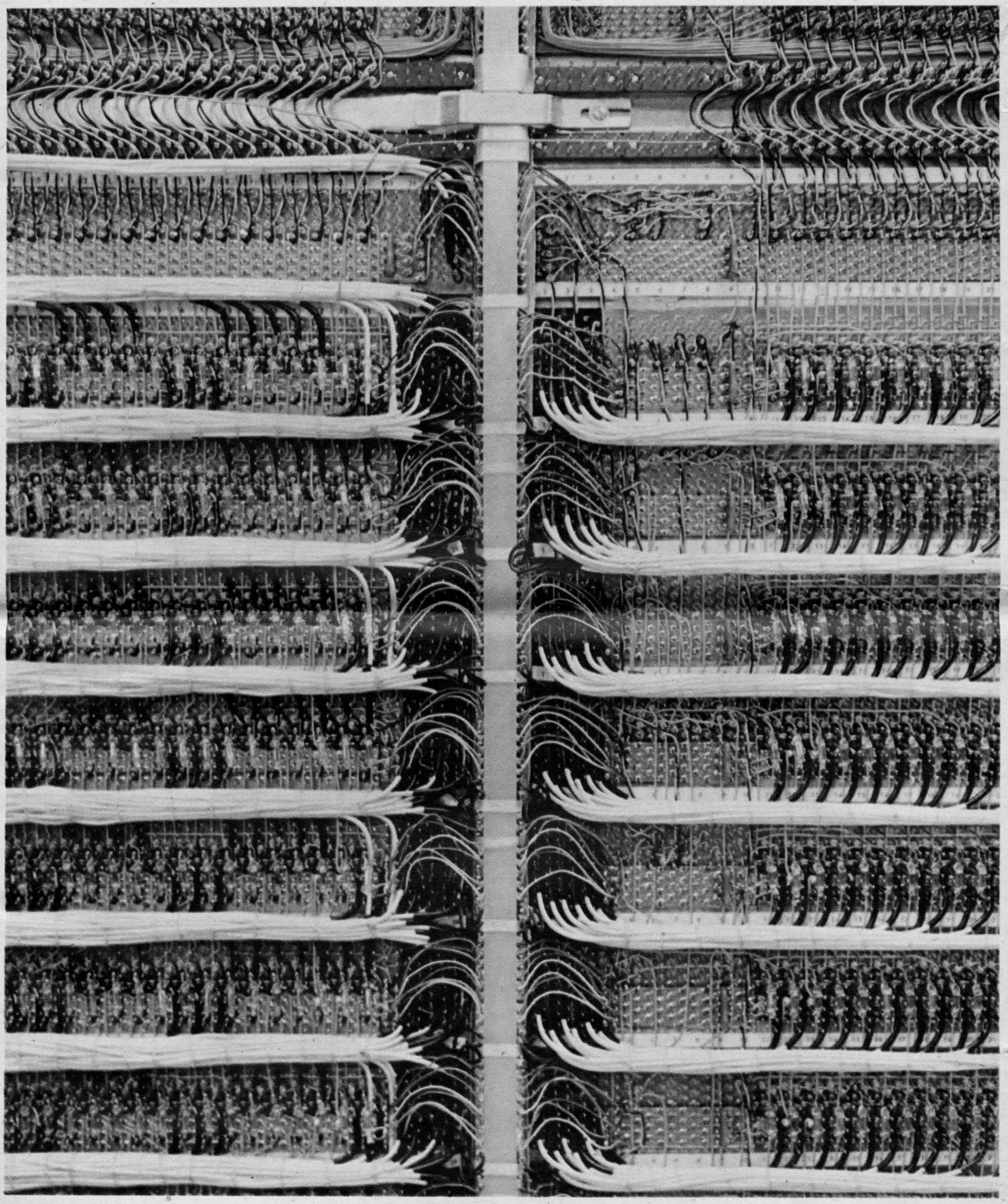
Weather Prediction

Electronic Data Processing is here being used to help analyze a weather map and predict future weather trends.



Inside a computer

This elaborate network of wires is part of the frame of the IBM 7090. Today's computers enable man to solve problems previously impractical to attempt because of their complexity.



Problem Solving in Space and Defense

In national defense and space exploration, the electronic industry's assignment is to help develop and manage information and control systems for advanced weapons and space vehicles. This requires special problem-solving capabilities. Some of the problems to be solved:

- Detection of enemy vehicles, from submarines to manned bombers and ballistic missiles — and the effective use of electronic counter-measures.
- Guidance for deep space probes—and the relay of information gathered by the vehicles to earth.
- Surveillance of unknown satellites—and calculation of their orbits.
- Gathering intelligence data automatically, around the world and in space—and analyzing it for display in the command control centers.

The solution to these problems is a total information and control system. Such a system gathers information from many remote points—around the world, underseas and in space, communicates data directly to computers at command control locations, and processes the data immediately into meaningful material for display and decision, making it possible to apply electronic controls instantly where needed.

Systems development

Problem solving for the Federal Government is the principal occupation of hundreds of IBM scientists, engineers, mathematicians, logicians and psychologists. This professional group designs systems solutions to meet the most pressing problems of space and defense agencies.

Examples of these studies include:

- Antisubmarine warfare: Detection is the basic problem here. The craggy terrain of the ocean floor provides cover for enemy submarines. Shifting currents, changing temperatures and differences in the amount of salt in the water may distort data gathered by detection instruments. Even schools of fish and their special "fish talk" can screen the sound of an enemy submarine. The Systems Center of IBM's Federal Systems Division is studying acquisition and processing of underseas data, and control of antisubmarine weapons systems.
- Air traffic control: The Systems Center is working with the MITRE Corporation and the Federal Aviation Agency to apply the experience acquired in developing the SAGE continental air defense system to the related problems of air traffic control and associated FAA research and development projects.
- Field army ballistic missile defense systems: The Systems Center is now participating in studies to specify the requirements for data-gathering sensors, advanced communications channels, data processing equipment and interceptor weapons involved in mobile systems to defend field armies against missile attacks.

Solving the paper problem

Advanced information and control systems techniques are also being applied to the largest paper handling problems of civil and military agencies of the Federal Government. A few examples are:

- A nationwide system of IBM data processing machines will be used by the Internal Revenue Service to improve collection of Federal taxes. Installation of this system will require several years. Starting in 1962 business returns will be processed on this system. In subsequent years all individual returns will be processed. The system will enable the Internal Revenue Service to carry a minimum three-year record on every taxpayer — individual and business — by 1969.
- The largest single bookkeeping task in the world—maintaining master records on the 135 million people covered by Social Security—is done on an IBM system. The computers update all records quarterly—based on the earnings reports submitted by employers.
- Another IBM information system is an electronic check list for the world's busiest comparison shoppers—supply agencies of military and civil departments and allied nations. Heart of the system is a large-scale IBM computer in the Armed Forces Supply Support Center of the Defense Department. The computer keeps track of three and one-half million Federal supply items—processing sixteen million characters of inventory information daily for government buyers, countries in the North Atlantic Treaty Organization, and other allied nations tied into the U.S. Defense Department logistics complex.

Closing the loop

The total information and control system is explained with the help of a new vocabulary—words such as input, output, real-time, closed-loop. These are new words, yet they describe functions as old as man and contained most perfectly in him.

The information system acquires data from many different sources—from radar stations to infrared sensors in a satellite. The data is communicated directly to the command control center, so computers can analyze it immediately and display results for human decision-making.

This is called closing the loop. The computer-communications system amasses millions of figure-facts about events as they occur—reducing these vast quantities of information so that their significance can be comprehended at a glance—and enables the operator to apply electronic controls instantly where needed. Thus it is possible for man in the space age to determine the outcome of events moving at fantastic speeds far beyond his horizons.

The operational control system becomes incredibly complex in space flight. IBM is helping to expand the three capabilities —space guidance, command control and communications—required to develop effective systems.

Space guidance

The nerve ends of information and control systems reach into several kinds of space: underseas—aerospace—outer space. For example, information-gathering sensors and guidance systems in space vehicles may transmit data directly to powerful computers on the ground—even as vehicles are proceeding on special missions.

A good example is the Orbiting Astronomical Observatory of the National Aeronautics and Space Administration. This will be a kind of infrared telescope in space—operating out of the distortion of the earth's atmosphere to help determine the characteristics of celestial bodies. IBM is developing a system, which will be housed in the orbiting observatory, to store the observations of the sensors in the satellite for eventual reduction into useful data by ground-based computers.

Guidance under the sea poses a special set of problems. IBM's Space Guidance Center is working—under the direction of the U.S. Navy—on development of automatic guidance techniques for nuclear submarines. The purpose of these studies is to bring the dark underseas world on a screen before the submarine commander —enabling him to maneuver the vehicle with increasing precision. With this capability it may be possible to man a submarine with a crew of 12 instead of 120.

The development of space guidance systems for manned aircraft has been intensive. The pilot in the B-52 bomber—first line of Strategic Air Command strike-back capability—uses an IBM computer system that enables him to fly a round-trip intercontinental mission to a target he may not even see.

Advanced radar "feelers" are being connected to the B-52 guidance system. This makes it possible to fly the bomber close to the ground — maneuvering over rugged terrain at top speed.

Successor to the B-52 will be the 2,000-mile-per-hour Air Force B-70 Valkyrie bomber. IBM is developing the guidance system for this craft, designed to ride its own shock wave twelve miles above the surface of the earth.

Beyond the B-70 is outer space. To guide a vehicle there requires a system designed to stand the jarring shock of rocket acceleration. This system must arrive in space intact—and once there function perfectly without maintenance.

Every pound of payload requires tons of thrust to deliver it outside the earth's atmosphere. This means that electronic guidance elements in a vehicle must be miniaturized—so that the system has the power of a roomful of electronic components, yet is compressed in a package not much larger than a portable television set.

IBM is developing a computer for the A.C. Spark Plug's ACHIEVER guidance system in the TITAN intercontinental ballistic missile. TITAN must be impervious to electronic jamming by the enemy. The solution is an all-inertial guidance system that plots its own course to the target while in flight.

Some advanced space and weapons guidance systems must be made immune to the impact of hard radiation. Under the direction of the Aeronautical Systems Division of the United States Air Force, a radiation-resistant computer is being developed to guide unmanned vehicles through an intense radiation screen—or into a nuclear bomb cloud.

The ultimate aims of space guidance are the moon, the other planets of our solar system—and beyond. Payload in space is precious. To help solve the problem, IBM is developing experimental computers with microscopic circuits deposited from metals in gaseous form.

Command control

The command center in 1864 was a tent. The general observed the battle around him and made command decisions. The command center in 1944 was a plot room where combat information was gathered and manually plotted on a board. It became possible for the commander to direct a battle he could not see.

Today, the command control center may be mobile, to follow fast-changing combat fronts. The commander disperses his units thinly to make them less rewarding as nuclear targets, so his need to gather and then analyze information immediately from distant locations is increased enormously.

To meet the requirement for rapid processing of battlefield information, IBM's Command Control Center is developing INFORMER—a mobile and powerful electronic computer. Conventional computer elements are replaced by rugged new electronic devices which are carried over rough terrain in a standard two-and-one-half-ton Army truck. INFORMER may also be flown by helicopter to meet a truck already in position.

Once in position the equipment is linked by communications channels to vital points along the front, so that the commander has immediate information about the enemy—and equally important, the current status of his own forces.

A prime requirement in global operations is for intelligence—information about the other side—collected and analyzed in time to do something about it. The means for doing this is the global computer-communications system. Such systems gather information about events around the world and in the skies as they occur, process this information immediately and display the results so that the commander may counter.

An example is the Air Force intelligence data handling system known as 438L. IBM has a prime study contract for this system which processes and displays intelligence data gathered in a variety of ways—from human reports to radar and other advanced sensors.

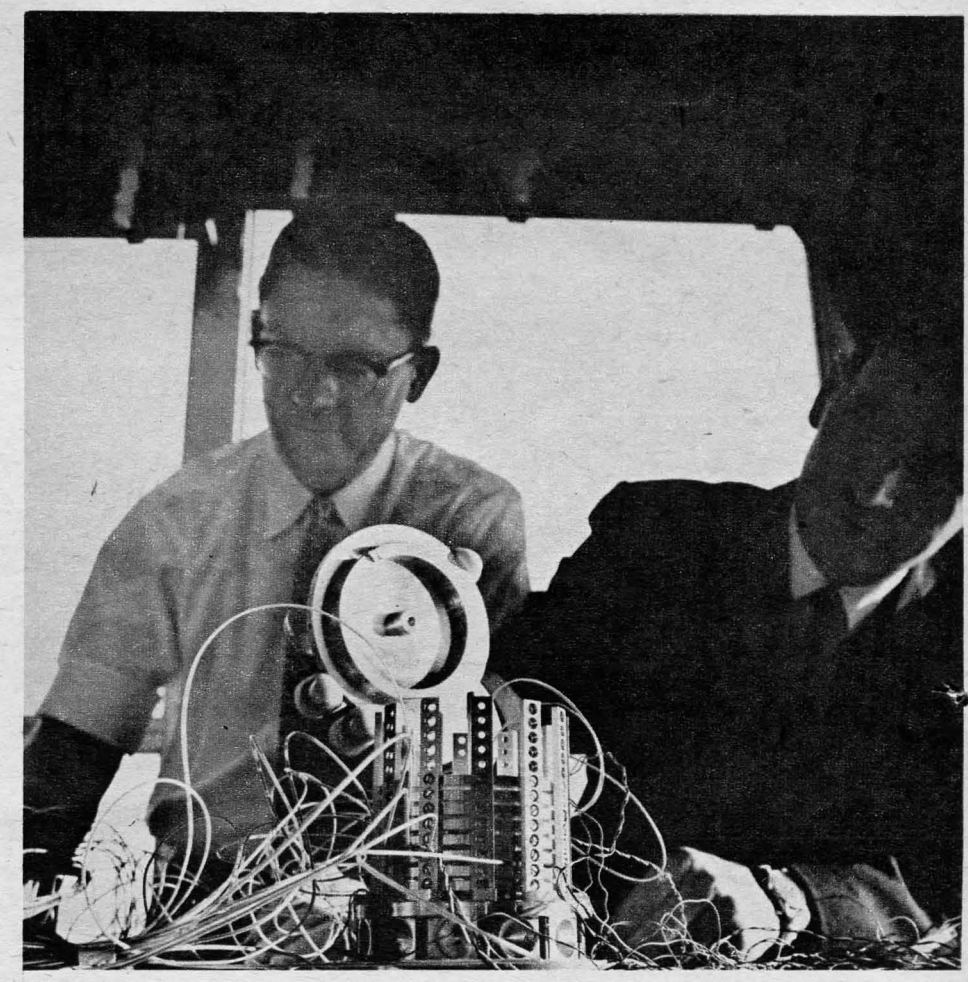
Companion to the 438L system is the Air Force 466L intelligence system for integrating vast quantities of data gathered by ground-based and airborne electromagnetic data collection stations. IBM's Federal Systems Division is an associate prime contractor on this project.

The security of our country depends on fast recognition of enemy missiles, should they be launched to destroy vital areas of the North American continent. Radar screens of the Ballistic Missile Early Warning System (BMEWS) scan the northern skies to detect these missiles. IBM 7090 computers, tied in with special communications channels, are being installed at Thule, Greenland, and Clear, Alaska, to compute the flight of missiles so they can be visually displayed at the Control Center some 5,000 to 6,000 miles away within seconds after the moment of detection. This display will permit NORAD commanders to consider any necessary action. BMEWS is being expanded by a third installation in Yorkshire, England, and the IBM 7090 will provide the system with fast computation of the missile's course.

The Air Force is also designing a system to keep a current inventory of its own deterent capability. The chief purpose of this system—known as 473L—is to enable headquarters, USAF, to monitor and assess the status of its world-wide resources, so that the Air Force can react even more quickly and effectively to emergencies.

The total information system may reach aloft to help control space exploration. An illustration of this activity is the tracking and control system for Project Mercury, the United States' manned space capsule program. IBM is developing the orbital time tables for Project Mercury in association with the Western Electric Company. The project includes a program to gather satellite tracking data in IBM computers at the NASA Goddard Space Flight Center and display the results for operational control of space missions.

Vast information-handling and control systems are helping the Federal Government meet its most urgent commitments to the American people. The IBM Corporation and its Federal Systems Division are proud to contribute to these purposes.



Compass computer

Scientists are seen here testing the logic section of the COMPASS *computer, to be used for a deep-space guidance system.*

This, Too, Is Tomorrow:

It is a Thai King's pledge of a better life for his people...a Swiss mathematician's ambition to stroll along the ocean floor...a Parisian oculist's promise of more accurate diagnosis of eye diseases...it is these and countless other hopes and dreams which make the world—and IBM—busier than ever these days.

Tomorrow sometimes begins yesterday.

For Thailand, tomorrow began during the 19th century reign of King Chulalongkorn, Rama V in the Thai dynasty. King Chulalongkorn vowed that his own people would have their share of the good life he had seen and heard about in other parts of the world. He abolished slavery, set up a postal system, and even planted trees along the roads to shade the rice farmers on their way to the Bangkok markets.

King Chulalongkorn would be proud of what has happened since. Bangkok, which began as a cluster of river houses raised on pontoons and bamboo stilts, is now a startlingly modern city. He might also savor the fact that a modern IBM data processing system is used in studies of the Thai national budget. These machines have a special meaning for us at IBM as well, since we feel data processing is one symbol of progress which means solid help to a nation moving ahead.

An exciting experience

Like Thailand, other nations are eagerly applying the latest technological tools. Industrial and economic transitions which once took generations are now accomplished in a few years. And particularly in the new nations, IBM machines are working overtime to help in the leap forward.

At the same time, new ideas and hopes are springing up everywhere. The world is in a hurry to get on with its future.

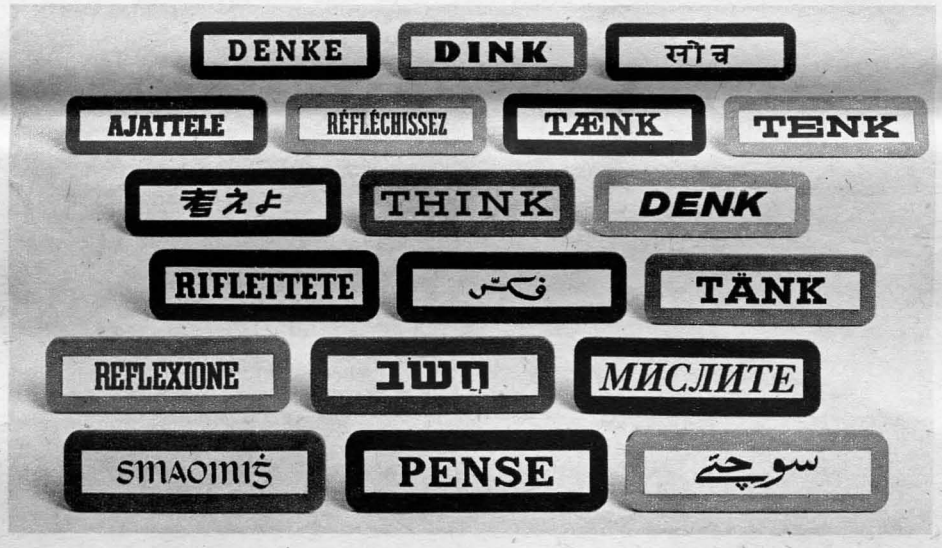
It is often an exciting experience.

In Switzerland some months ago, a young mathematician staked his life on an untested formula and the circuitry of an IBM computer to prove that deep-sea diving was not limited to a few hundred feet. Hannes Keller believed that the "bends," usually caused by ascending rapidly from lower depths, could be prevented by breathing a special mixture of gases—the proportions varying with the depth. He worked out new decompression tables on an IBM computer, and used the formula for a record-breaking test dive. Next he will try to reach the continental shelf. Success will mean that the continental shelf zones, those undersea projections which total 10,608,000 square miles, will then be open to prospecting for their wealth of untapped resources.

In Africa, agricultural experts have used IBM punched cards to classify soil test samples in a search for more productive ways of growing coconuts. Similarly, at an Austrian experimental station, a computer has helped to evaluate seeds to determine which type of corn is best suited for cultivation in that country.

In Tokyo, weather forecasters use an IBM computer to provide warnings, days in advance, of the savage typhoons which periodically lash the Pacific area.

A Parisian oculist's IBM cards, punched in code, "know" some 200 separate symptoms of approximately 350 different eye diseases. With the aid of a computer at the IBM data center in Paris, the doctor makes swifter, more accurate diagnoses by narrowing the possibilities first to a few diseases, finally to the specific one. Punched cards have also been used in a German clinic as a research aid in studying the effects of ear surgery.



These examples give meaning to the word "International" in the IBM name. IBM World Trade Corporation, an independently operated subsidiary of International Business Machines Corporation, coordinates all IBM business outside the United States. Actually, it is a family of companies in 90 countries—IBM has operated in some of them for more than 40 years. In these countries throughout the world there are now more than 34,000 employees, 18 manufacturing plants, 6 laboratories, and 283 sales locations. The demand for its services and equipment can be gauged by the fact that IBM World Trade's business has multiplied over 7 times in a little more than a decade.

Rising expectations

IBM machines from electric typewriters to large computers affect almost every human enterprise. They are humming away in almost every country of the free world. They are being used to drive ahead—sometimes swiftly, sometimes cautiously—to meet the rising expectations of peoples who have come to believe, like the American pioneers, that life can be just as good as they themselves make it.

The more dramatic applications of IBM equipment are the most familiar—for example, jobs such as "flight-testing" the designs of the Caravelle jet airliner on an IBM computer in Paris, and helping to design the Rolls-Royce jet engines. Even though these are important and exciting, a complete story of IBM would have to include the thousands of ways in which IBM machines are helping man do his everyday work faster, more efficiently.

In Bolzano, Italy, a restaurateur uses punched cards to keep track of the spaghetti for several restaurants. A fruit exporter in the same town uses punched cards to prevent overstocking of apples. In Brazil, they use IBM equipment to compute statistics on coffee crops and exports.

In England, IBM equipment helps in educating new drivers. The University of Vienna has used an IBM computer to create a whole new traffic pattern for the city. For Canada, IBM has developed special census equipment. Other IBM machines tabulate census statistics in Ghana, Kenya, Tanganyika, Uganda and Zanzibar. In London, IBM machines record bids during the city's annual fur auctions.

IBM machines are assisting in atomic research for industry in Switzerland and Japan. They are helping where steel is produced, where ships are built, where oil wells are drilled. They are at work in transportation, in real estate, in insurance, in advertising, in banks, in agriculture, in medicine, in factories, in government, in laboratories, in education, in mining, in construction, in mail-order houses.

A fresh wind

If there is a "wind of change" in the world, it is a fresh wind. There have been scattered squalls, but no hurricane. It is not too much to hope that man will soon see the last of war.

He has better things to do.

He is bent on remaking the world as he wants it to be. A few national colors once dominated maps; now the cartographers are running out of pastels. The lesson behind the headlines is clear and urgent; as independence grows, *inter*dependence makes it strong. The strain may show sometimes, but man is learning the lesson. The idea of nations working together is becoming, at long last, an accepted necessity. The fences are coming down.

This idea is implicit in our own IBM motto, "World Peace Through World Trade." It is important to us not only as a company, but also as individuals since almost every one of us is a national of the country in which he works.

This fresh wind promises much more than peace. Man is now resolved to beat back the limitations of his environment, to free himself for the challenges of his imagination with tools that multiply his powers by a thousand times a thousand.

At IBM, our part is to make a few of the tools which man needs in his bold new quest. They will continue to be as good as we can make them.

In Bangkok

A young Thai girl works at an IBM punched card sorter. Across the palace grounds is the Temple of the Emerald Buddha.

Printed in U.S.A.

IBM World Trade Corporation

and its subsidiaries, which conduct the IBM business outside the United States, employ 34,000 people and operate 18 plants ⊙, 6 laboratories ⊙ and 283 sales locations ◉ in 90 countries.

1 Algeria ●	14 Cambodia ●	27 France ●■▲	40 Iraq ●	53 Malta ●	66 Peru ●■	79 Taiwan ●
2 Angola ●	15 Cameroun ●	28 Germany (West) ●■▲	41 Ireland ●	54 Martinique ●	67 Philippines ●	80 Thailand ●
3 Argentina ●■	16 Canada ●■	29 Ghana ●	42 Israel ●	55 Mauritius ●	68 Portugal ●	81 Trinidad ●
4 Australia ●■	17 Ceylon ●	30 Greece ●	43 Italy ●■▲	56 Mexico ●■	69 Republic of the Congo ●	82 Tunisia ●
5 Austria ●	18 Chile ●■	31 Guatemala ●	44 Jamaica ●	57 Morocco ●	70 Rep. of the Ivory Coast ●	83 Turkey ●
6 Bahamas ●	19 Colombia ●■	32 Guinea ●	45 Japan ●■	58 Netherlands ●■▲	71 Saudi Arabia ●	84 Union of South Africa ●
7 Bahrein ●	20 Congo Republic ●	33 Haiti ●	46 Jordan ●	59 Netherlands Antilles ●	72 Senegal Republic ●	85 United Arab Republic ●
8 Barbados ●	21 Costa Rica ●	34 Honduras ●	47 Kenya ●	60 New Zealand ●	73 Singapore ●	86 United Kingdom ●■▲
9 Belgium ●	22 Denmark ●	35 Hong Kong ●	48 Kuwait ●	61 Nicaragua ●	74 Southern Rhodesia ●	87 Uruguay ●
10 Bermuda ●	23 Dominican Republic ●	36 Iceland ●	49 Lebanon ●	62 Norway ●■	75 Spain ●	88 Venezuela ●
11 Bolivia ●	24 Ecuador ●	37 India ●	50 Libya ●	63 Pakistan ●	76 Surinam ●	89 Vietnam ●
12 Brazil ●■	25 El Salvador ●	38 Indonesia ●	51 Luxembourg ●	64 Panama ●	77 Sweden ●■▲	90 Yugoslavia ●
13 Burma ●	26 Finland ●	39 Iran ●	52 Malagasy Republic ●	65 Paraguay ●	78 Switzerland ●	

VOLUME 12 BRINGS TOYNBEE TO TOWN

He Meets and Charms His Critics at a Reception

By McCANDISH PHILLIPS

With disarming modesty and warmth, Prof. Arnold Toynbee submitted to a writer's nightmare yesterday. He sipped sherry at a cocktail reception where the guests included a dozen writers and historians who have publicly criticized his work, sometimes with goodwill, sometimes with outraged scorn.

The sponsors of what might have been a very sticky wicket, indeed, the Oxford University Press, trusts the civility of the urbane. Oxford will publish today the twelfth volume of Dr. Toynbee's "A Study of History." The book is called "Reconsiderations." The reception was held at the publisher's offices at 417 Fifth Avenue.

As it turned out, the most aggressive persons at the party were the waitresses, who proffered cheese and lobster as if they were being paid for piecework. When they had made the route with their last tray Professor Toynbee could express only one reservation about the party.

"I was a little disappointed," he said, "that the fiercest of my critics couldn't come." He said Pieter Geyl, his chief gainsayer, had unfortunately fallen sick.

Guests Await Him

People who were eager to meet him stood, a bit stiffly, as near to Dr. Toynbee as possible without precipitating themselves into his conversation. There they waited, arranging their smiles, until he glanced in their direction.

"Scraps of talk" was the term Professor Toynbee used to describe the experience. But some of the talk was so learned as to be unintelligible.

"He has that quality that is so rare in this competitive age when people are always jockeying for position," one guest said after he had chatted with him. "He offers a perspective which is really the greatest need of the moment, to look above and beyond the turmoil and the imminence of crises to see a pattern and a certain resolution."

Dr. M. F. Ashley Montagu, who edited a collection of essays criticizing Dr. Toynbee's views—"Toynbee and History," published in 1958, talked to the historian at the party. Afterward, he said:

"Everything we said in that volume has been fully supported since. Dr. Toynbee's 'Reconsiderations' has confirmed the view that many of his ideas are open to question and some of them demonstrably unsound. In this new book it is gratifying to see that he has taken into consideration the criticisms that have been made and has modified his views accordingly.

"It seems to me that this is the essence of the scholar's position, that he will take into consideration any criticisms that are soundly put forward. It will never be said, however, that Dr. Toynbee's mind was so open that his brains fell out."

Prof. Sidney Hook, Chairman of the Department of Philosophy of New York University, was another Toynbee critic present.

"I do not agree with his belief that culture has to be oriented toward religion, and I defended a secular, humanistic view," Professor Hook said yesterday of an article he had written ten years ago in the Partisan Review.

Religion At Issue

"Toynbee believed that one must have a religious outlook on the world to serve as a foundation for liberal democratic values. I would say that religion can support values. Religion may lean to democracy, but it may also lean to totalitarianism. I believe these values are justified in experience, pragmatically, whereas Toynbee believes that they are justified transcendentally."

A man told Professor Toynbee that he was about to do some writing on a rogue. "But don't hold it against me," the guest said. "I think he was a very nasty man."

"Oh," Professor Toynbee said with a touch of pleased surprise. "Very well. Heh, heh."

The historian was asked if critics played a useful role in letters.

"Some critics just want to bludgeon, get a knife into you, and you can't do much with them," he said. "But some are concerned to advance the cause of knowledge. Then, however severe they are, I pay great attention to what they say, and I try to think again because of what they have said. They keep one's mind on the move. What's fatal is to keep defending your past positions."

Professor Toynbee said there might be a thirteenth volume of "A Study of History," if further criticism made it necessary and he lived that long.

The Student of History

Arnold Joseph Toynbee

THE young man on the platform was a striking figure, with a generous thatch of slightly wavy hair surmounting a high forehead. His features were even, the nose long and thin, and he was, on the whole, smooth-faced.

Man in the News

There was, however, a sculptured look about his jaw and cheekbones, giving his well-bred look the added grace of jagged masculinity. There was a restlessness that night in 1926 as the young historian told a large London audience that the United States, already the world's largest creditor nation, was swiftly "dwarfing" a declining Europe. The audience stirred under the sting of the words. To one side of the platform, a slender figure with a full white beard rose from his seat and faced the lecturer. The audience broke into applause.

"I'd like to ask Professor Toynbee a hypothetical question," George Bernard Shaw announced in rich Irish tones. "If he were going to live two or three hundred years [laughter rippled across the hall], would he choose a debtor or a creditor country in which to settle?"

He Pleases Crowd

There was a loud burst of enthusiasm as Shaw sat down, looking very much like Father Time.

"Well," Prof. Arnold Joseph Toynbee said slowly, "I think I should choose a debtor country." Shaw beamed, the professor laughed, the audience cheered and everybody went home pleased. But the paradox was not explained.

Expands on Theme

Later, sitting in his book-lined retreat in London's West End, Professor Toynbee expanded his theme further into the future.

American ascendancy is hardly permanent, he said. Nothing short of the economic organization of the world into one unit will preserve industrial prosperity, he declared.

This is a theme to which Professor Toynbee has returned many times—a world civilization. In 1926, however, he had not begun to write his twelve-volume work "A Study of History," of which the twelfth and possibly (but not necessarily) last volume will be published today. It is called "Reconsiderations."

"It is a little silly to attempt to summarize a work of such appalling Mediterranean erudition," a critic once said of "A Study of History." The first ten volumes of the work have been abridged into two volumes and have achieved a considerable vogue, even to selection by the Book-of-the-Month Club. Time magazine has been Professor Toynbee's most persistent interpreter.

In the forty years Dr. Joynbee has mulled and outlined and written his "Study," he has also written at least a dozen other books. His work is marked, Kenneth Scott Latourette wrote, "by a comprehensiveness which embraces all of mankind and the entire sweep of history."

Awoke to History Early

Professor Toynbee was born in 1889, barely in time to receive a thoroughgoing classical education before the fashion passed. He awoke to history early through books and monuments.

He later became an adviser on Near Eastern affairs to the British delegation at the Versailles conference. He held professorial chairs in Byzantine and Modern Greek language, literature and history at the University of London, and in international history at the London School of Economics.

When he was director of studies at London's Royal Institute of International Affairs, there was a fire exit near his office door. Colleagues posted a sign with an arrow pointing to the door. It read: "Alternative Means of Escape."

In 1913 he married the daughter of the classical scholar Gilbert Murray.

Professor Toynbee was divorced after World War II. He married Veronica Boulter, his secretary and researcher. He has two sons by his first marriage.

Though he is a man of great energy, his amiability and willingness to engage almost anyone in conversation is frequently remarked. Once, in the basement barbershop of a Chicago hotel, a friend noticed that he was "talking and talking" with the barber. The friend said afterward, "You were having quite a discussion." "Oh yes," Professor Toynbee replied, "We were discussing international affairs. He has some very sound views."

No Monologist

"He does not push himself forward," an acquaintance said of the Professor, "He likes to get other people's ideas. He's no monologist."

Of the present time, Dr. Toynbee writes in his Latinate polysyllabic style:

"This swift succession of catastrophic events on a steeply mounting gradient inevitably inspires a dark doubt about our future, and this doubt threatens to undermine our faith and hope at a critical eleventh hour which calls for the utmost exertion of saving spiritual faculties. Here is a challenge which we cannot evade, and our destiny depends on our response."

THE NEW YORK TIMES, THURSDAY, MAY 4, 1961.

The New York Time

EXCHANGE VIEWS: Prof. Arnold J. Toynbee, left, discusses problems of mutual interest with Rabbi Isidore B. Hoffman, center, adviser to Jewish students at Columbia University, and the Rev. George B. Ford at the cocktail party at Oxford University Press.

NEW YORK TIMES, SUNDAY, FEBRUARY 19, 1961.

36 Million Given to Princeton In First 2 Years of Fund Drive

Collections Mounting at Rate of $1,000,000 a Month—Alumni Awards Presented

Special to The New York Times.

PRINCETON, N. J., Feb. 18—Princeton University's campaign for $53,000,000 has been advancing at a pace of better than $1,000,000 a month, the general chairman announced today.

James F. Oates Jr. said the drive had collected a total of $36,169,572 since it was started two years ago. Mr. Oates made his report to 1,000 Princeton alumni and their wives who gathered in Dillon Gymnasium for the forty-seventh annual mid-winter meeting of the university's alumni association.

A year ago, the drive had collected $23,320,000, Mr. Oates said. Since then, $12,849,572 more has been obtained.

The three-year drive will end next February.

Three awards were presented at the luncheon. Dr. Robert F. Goheen, the university's president, presented the Woodrow Wilson Award to Raymond B. Fosdick, former president of the Rockefeller Foundation. This award is presented annually to a Princeton graduate who has made a distinguished contribution to the nation. The award carries with it a cash stipend of $1,000.

The M. Taylor Pyne Honor Prize was presented to Jeremiah M. Sullivan, a senior from Old Orchard Beach, Me. The award, given for scholarship and for support of "the best interests of Princeton University," is the highest general distinction Princeton can confer on an undergraduate.

Walter B. Slocombe of Ann Arbor, Mich. and Daniel N. Stewart 3d of Hickory, N. C., received the freshman first honor prize. It is presented each year to the student (or students) who ranks first academically at the conclusion of the freshman year. A token cash grant is presented to the winner.

Amos Eno reported on the university's annual giving campaign of which he is chairman. He said more than $1,300,000 had been collected. The drive ends Wednesday.

Jeremiah M. Sullivan

Six alumni were nominated for two four-year terms as alumni trustees. One will be elected to an at-large post by a vote of all alumni. The second will be a trusttee from District 4, the Western States.

The following were nominated for trustee at large: James R. Forgan of New York, senior partner of Glore, Forgan & Co., investment bankers; Charles D. Jackson of New York, publisher of Life magazine; Adolph W. Schmidt of Pittsburgh, vice president and governor of T. Mellon & Sons.

The nominees for the District 4 post are Casper F. Hegner of Denver, a partner in the architectural firm of Smith & Hegner; Jaquelin H. Hume of San Francisco, vice president and director, Basic Vegetable Products, Inc., and Norman S. Nyce of Pasadena, Calif., vice president and director, the William Wilson Company, real estate brokers.

Results of the balloting for the two posts will be announced this June.

THE NEW YORK TIMES, TUESDAY, MAY 6, 1958.

Books of The Times

By CHARLES POORE

IN a world that talks a good deal about the dignity of man George Washington will always personify dignity. Yet in a land that can create folk heroes almost overnight, he was seldom folksy. These characteristics create wonderfully challenging problems for his biographers. They are examined in a new book by Marcus Cunliffe that contains many acute insights—"George Washington, Man and Monument."*

Mr. Cunliffe, a historian educated at Oxford and Yale, is a British subject. He is naturally drawn to write about Washington because American history is his field. He teaches it at the University of Manchester in England and is now writing a volume on the United States from 1789 to 1937 for the Chicago History of American Civilization. The fact that George Washington was a British subject for more than half his lifetime also has a certain relevance.

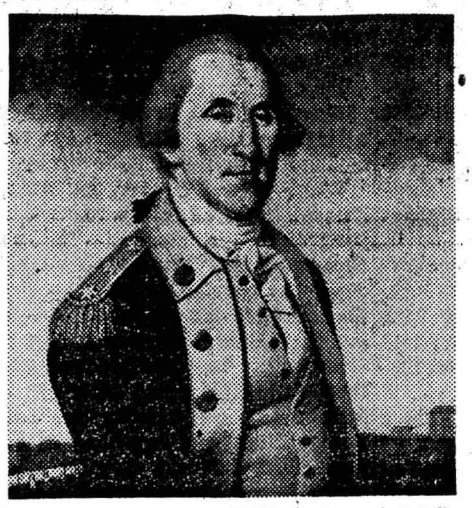
In reading about Washington one sometimes gets the impression that biographers have starting difficulties in seeing the forest of his achievements because they are too much obsessed with the fable of a cherry tree.

How does Mr. Cunliffe get around that? Well, he does spend quite a lot of time cutting down the Parson Weems legends. This, by now, is standard procedure. It doesn't really get anywhere, because the cherry-tree symbol is hardier than anything that has appeared in its place. The symbol Mr. Cunliffe offers is the massively towering stone of the Washington Monument. And that, after all, is what the people who spent so much of the nineteenth century building it intended. But nothing will ever quite uproot the mythical tree.

Weems Touch Missing

The truth is that Parson Weems, as a fabulist, really humanized Washington—and all the precisians, working with documented material, can do is to explain why, for them, the task is so very, very hard. In his own way, Weems had the same creative advantage over history that we find in Shakespeare's poetry. No such advantage accrues to Mr. Cunliffe when he tells us that "Washington has become not merely a mythical figure, but a myth of suffocating dullness, the victim of civic elephantiasis." The meaning, to Americans, of just two words—Valley Forge—disposes of that clinical flight of words.

The excellence of Mr. Cunliffe's book lies elsewhere. It lies in the compact way he has given us the main outlines of Washington's career. Those who have not the patience and say they have not the time to go through the volumes of Douglas Southall Freeman's majestic, incomplete biography will find here a sparkling flow of informed talk. Talk on Washington as a young frontier soldier and surveyor, Washington as an expansive Virginia landowner, Washington as commander of revolutionary forces, Washington as President mediating between the ideas of Jefferson and Hamilton, Washington as the squire of Mount Vernon.



Painting by Charles Peale Polk
George Washington at Princeton

New Englanders will not be ungovernably delighted at the way Mr. Cunliffe scants the galvanic events at Lexington and Bunker Hill. Yet that seems a valid attitude, from a Virginia point of view, of New England's hours of martial glory. Nor is Mr. Cunliffe particularly good on such contrasting scenes as Valley Forge, Yorktown and the warm days in Philadelphia when the United States was hammering out its Constitution. He is so gentle with George III that one feels he would gladly have helped Jefferson draft a considerably more bland version of the Declaration of Independence.

Yet he does not get his mind, or ours, into the indignant turmoil that some historians can achieve when they discuss the Conway Cabal to replace Washington with Gen. Horatio Gates. All great commanders have had subordinates who, on occasion, were insubordinate. And in America's wars, at any rate, the home landscapes have always been strewn with armchair strategists who were willing to give tremendously valuable advice from afar.

French Role Cited

A biographer, Mr. Cunliffe suggests, should put himself in his subject's shoes—but not in his pocket. Standing there, with a clear vision, he can pick up standardized, as well as unorthodox, ideas. When Mr. Cunliffe says, for example, that in retrospect we can see that the French alliance was the turning point of the Revolutionary War, few will find novelty in the statement. After all, there is, or used to be, a big painting at Versailles showing Yorktown as one of the great French victories.

At the end of the book, Mr. Cunliffe pays full, carefully measured honors to Washington. Measured, but not balanced, as they might well have been, with evocations of Lincoln and Lee. They too have great places in war, in peace and in the hearts of their countrymen.

*GEORGE WASHINGTON, Man and Monument. By Marcus Cunliffe. With portrait and maps. 234 pages. Little, Brown. $4.

APPLICANTS DROP AT IVY COLLEGES

Fewer Unqualified Students Seeking Admission, Says Princeton President

Special to The New York Times.

PRINCETON, N. J., Feb. 15—Dr. Robert F. Goheen, president of Princeton University, said today that while the number of applicants to most Ivy League colleges had declined this year, their scholastic quality was on the rise.

He said the decline was not because of disenchantment with the institutions, but rather that counseling had been more effective.

At a press conference, Dr. Goheen said that "although the over-all number of applicants is down from last year, the number of qualified applicants has risen appreciably."

"Secondary schools," he added, "are exercising more care in selecting those students to encourage to apply to institutions like Princeton. We had fewer clearly nonqualified applicants this year than ever before."

In 1960, according to Princeton's admissions office, there were 5,324 preliminary applications. This year the number dropped to 4,927, a decline of 397. The figures on completed application forms are not yet final.

Yale, Harvard and Columbia also reported declines in applications this year.

It was reported at these institutions that the decline was due to several factors, including better counseling and evaluation at the secondary school level.

The decline, it was said, also stemmed from fewer multiple applications to the Ivy League colleges. Many of the potential applicants, it was noted, had been made to realize that they were not Ivy League caliber and should not waste their time or that of the college.

It also was pointed out that the number of applications was abnormally high last year as students accepted published reports that most colleges were rapidly reaching saturation points. Harvard had a 15 per cent increase in applications last year over 1959. Even with its present decline, an admissions officer said, Harvard has more applications this year than in 1959.

C. William Edwards, director of admissions at Princeton, said it was his understanding that most Ivy League colleges had experienced a decline in applications this year. The others are Pennsylvania, Dartmouth, Cornell and Brown.

Tufts Names Vice President

Special to The New York Times.

MEDFORD, Mass., Feb. 15—Dr. C. Russell de Burlo Jr. has been elected vice president and controller at Tufts University, it was announced today. Dr. de Burlo came to Tufts as budget officer in 1949.

PRINCETON OFFERS EAST ASIAN STUDY

Year in Orient Will Be Part of an Extended Program for Undergraduates

Special to The New York Times.

PRINCETON, N. J., Feb. 4—An unusual program in East Asian studies, providing undergraduates with a year in the Orient between their sophomore and junior years, has been established at Princeton University.

The program will permit students to interrupt their normal course of study for a full year, and to return to Princeton as juniors after their time abroad. Dean Jeremiah S. Finch said the program would shorten study leading to a doctorate by "at least a year."

At the same time, he indicated, the student who has spent the "intervening" year in the Orient will have more intensive training in his field than the average undergraduate who majors in East Asian studies.

"In so far as we know, this is the only program of its type in the country," said T. Cuyler Young, chairman of the Department of Oriental Studies.

Few undergraduates, Dean Finch said, major in programs in Asian studies, and those who take such a course often are forced to miss much of what their college offers in Western studies. The five-year Princeton program seeks to integrate Asian studies with the liberal arts curriculum, he explained.

At the conclusion of his five years, the East Asian major will receive a Bachelor of Arts degree and will be able to obtain his doctorate "probably in two years," Dean Finch said. Most language-study doctoral programs require three to four years.

During his time abroad the student will be permitted "a great degree of freedom," Dean Finch went on. The student might choose to work in the foreign country, auditing courses at a native university, or he might wish to pursue a year's formal education at the foreign institution. The year abroad will not be counted as one of the undergraduate's four years at Princeton.

According to Professor Young, the student who studies under the new program will receive training equivalent to that of a student who spends six years in this country obtaining a master's degree in the East Asian field.

NAZI ERA HISTORY BAFFLES GERMANS

Revision of Texts, Initiated After Swastika Daubings, Mired in Confusion

By GERD WILCKE
Special to The New York Times.

BONN, Germany, Feb. 4 — More than a year after the rash of swastika smearings in West Germany, educators are still groping with the problem of how to tell school children of the country's Nazi past.

As one consequence of the chain of events that started with the daubing of Nazi symbols on a synagogue in Cologne on Christmas morning, 1959, the country's cultural ministers hurriedly agreed to another revision of history books.

The revision, they decided, should eliminate gaps and remove distortions. But most of all, they agreed, the books should be complete enough to allow the students to learn about history up to the present.

Although some states acted immediately by withdrawing a number of textbooks and by generally intensifying the teaching of history and civics, others merely asked specially formed commissions to "study" the matter and draw up recommendations.

The recommendations, although forwarded to the Permanent Conference of Cultural Ministers, an agency in Bonn representing the states in cultural matters, so far have not been put into practice.

Publishers Lack Guide

Thus the country's publishers of textbooks lack a comprehensive guide. They are continuing to print mostly the same books with the same content they had a year or more ago.

For a 16-year-old high school student in Heidelberg this means, for example, that he still reads in his history book that "the deeper reasons for World War II are to be found in the tensions caused by the 1919 Versailles Peace Treaty." There is not a word explaining to him Hitler's "reasons" for marching into Poland.

Though he will find a short paragraph telling him about Hitler's racial policies and the "killings of millions of Jews," he will search in vain for any mention of the so-called Nuremberg laws of 1935 setting forth Nazi goals to purify the "Nordic race."

The section of the book dealing with World War II tells the student about Allied bombings of German cities, but fails even to list the names of Rotterdam and Coventry.

Though some of the more pertinent facts are there, the way they are told leaves doubts whether certain phrases have not been borrowed from Nazi terminology.

For example, one subtitle refers this way to the annexation of foreign territories by Hitler: "The Sudetenland and Austria come to the Reich."

Creation of Jobs Cited

Or, a paragraph dealing with the regime's initial difficulties tells that the Nazi party gained more and more members "because Hitler, through the generous creation of jobs (by building autobarns and other such projects) removed the country's economic crisis."

The shortcomings in this presentation of recent history to the new generation — the book cited is used by students who were just born when the war ended—are freely acknowledged by both Government officials and educators.

They say that the problem is made worse by a lack of teachers who have the training and are willing to teach modern history.

In the words of Prof. Marianne Meyer-Krahmer, a 41-year-old high school teacher in Heidelberg, teaching the young in the historical and political fields still is "precarious" in West Germany.

She said that because of a lack of qualified instructors many teachers with Nazi backgrounds were called on to discuss recent history in their classrooms at a time when they were unwilling yet to discuss it in their own homes.

Damaged Image of Parents

"For others, even if they did not have a Nazi past, the task also was very difficult because telling the young about Hitler often meant destroying the image many children had of their parents," Professor Meyer-Krahmer said.

The educator is the daughter of the late Dr. Karl Goerdeler, the former Mayor of Leipzig who was hanged after the July 30, 1944, plot against Hitler's life failed. With the rest of her family, she spent the remainder of the war in concentration camps.

In Professor Meyer-Krahmer's view, the problem cannot be solved completely until the older generation of teachers has died out.

12/18/60 Sunday

STATE BAR MOVES TO TIGHTEN CURBS

New Rules Make It Easier to Discipline Members— Upstate Cases Cited

Special to The New York Times.

ALBANY, Dec. 17—New rules designed to sharpen disciplinary procedures against upstate lawyers were announced last week by the State Bar Association.

The rule changes resulted to a large extent from the fact that no action within the profession has been taken against some upstate attorneys who have been convicted recently of evasion of Federal income taxes.

They also reflect a growing concern among members of the association and the bench that bar associations in some of the smaller upstate counties have not fulfilled their disciplinary obligations.

All actions to discipline a lawyer are brought before the Appellate Division of the State Supreme Court. The new State Bar Association procedure has the support of the Appellate Division's Third and Fourth Departments, which cover the fifty counties north of Dutchess and Orange.

Presiding Justice Francis Bergan of the Third Department said this week that he considered the new stiffer regulations "a great improvement." He indicated that Presiding Justice Alger A. Williams of the Fourth Department shared his views.

Although the association is a state-wide organization, it does not plan to invoke its new authority in New York City because it believes the existing bar association there has the problem well in hand.

How Rules Are Changed

Under its old rules, the state association could not bring a disciplinary case to the attention of the Appellate Division without favorable votes by its thirty-member grievance committee and its sixty-seven-member executive committee in each case. As a practical matter, this seldom happened.

Under the new rules, the state association will be able to petition the Appellate Division directly for an investigation where a local bar association has failed to act against a lawyer suspect of unethical practice.

Affected will be all the 15,000 or so lawyers who practice in the Third and Fourth Departments, whether or not they are members of any association. The state association, in these cases, acts in the role of a private citizen bringing a complaint rather than an organization policing its own members.

The new rules give a local bar association sixty days in which to act upon a complaint. If it does not act, the State Bar Association may assume jurisdiction and take the lawyer to court if that appears necessary.

Association officials emphasized that there was no evidence that large numbers of lawyers were engaged in unethical practices upstate but that the emphasis was on disciplining the small number that might be.

The new rules were drafted by John R. Davison of Albany, a former state solicitor general engaged by the association to improve its disciplinary machinery.

JOHNS HOPKINS SETS HIGHER STUDY PLAN

BALTIMORE, Dec. 17 (AP) —John Hopkins University School of medicine announced today a grant of $235,000 to develop a formal and short term program of study for physicians after they earn their degrees.

The Commonwealth Fund made the grant in hope it would "usher in a new era in post-doctoral medical education and that it may serve as a model to other institutions in the country."

The Johns Hopkins two years ago inaugurated a program by which students could obtain a medical degree in five years, two years less than the previous standard.

Dr. Thomas B. Turner, dean of the faculty, said the change was "succeeding beyond expectations," and declared:

"Now, a complementary step is to examine carefully the wide area of post-doctoral medical education in the hope that acceleration and enhancement of quality might be achieved."

The need is emphasized by the presence at the Johns Hopkins of 424 post-doctoral students, eighty-eight more than the number of undergraduate medical students.

Band Directors Elect

CHICAGO, Dec. 17 (AP)— Frank A. Piersol, director of bands at Iowa State University was elected president of the College Band Directors National Association today. Other officers named at the association's eleventh annual meeting were: Vice president, Keith L. Wilson, director of bands, Yale University, and secretary-treasurer, Charles Minelli, Ohio University.

DO NOT FORGET THE NEEDIEST!

LAW DEAN WARNS ON RESEARCH JOBS

Warren of Columbia Urges Caution Lest They Curb Educational Tasks

Law schools have been warned against eagerly assuming and executing "any and all research projects."

Dean William C. Warren of the Columbia University School of Law cautioned the schools against accepting projects "of such scope as to demand that the principles of the assembly line be adapted to intellectual work."

In his annual report to Dr. Grayson Kirk, president of the university, the dean declared this week that projects "conceived outside the doors of a school are not always contrived with regard to or understanding of, the necessities and purposes of the institution."

The educator had praise, however, for foundations and persons supporting research activities while at the same time appreciating the educational responsibilities of the university.

He noted that foundations had made possible undertakings that would have been beyond the financial resources of the school, but he added that the research work had been "animated by the purpose of fructifying our teaching."

"The promise of enhanced prestige or temporary financial advantage implicit in many research projects," Dean Warren said, "ought invariably to be weighed against the promise of the project for the advancement of learning.

Duty to Profession

"In addition to what is owed the individual who comes to us to be trained in the law, there also rests upon us a duty to our profession and, because of the public nature of the lawyer's function in our society, a duty to the community."

The dean said help from foundations and individuals was necessary if the school was to continue to make contributions to the law and to legal science.

"But such help," he added, "must be given on our own terms. Every discipline should be the guardian of its own scientific development. This is a duty none should let fall into alien hands, no matter how well-intentioned these may be."

Last year the dean said in his annual report that inability of law students to write "reasonably literate English prose" had reached "epidemic proportions."

This year the dean again stressed the need to improve the writing ability of students. He said a joint committee appointed last year has recommended that a writing test be given to all applicants for admission to the law school. He urged other schools to adopt a similar program in consultation with their undergraduate colleges.

SCIENCE

BASIC PARTICLES

High-Energy Physics Talks Deal With Building Blocks of Universe

By HAROLD M. SCHMECK JR.

A group of the world's foremost nuclear physicists spent last week in Rochester, N. Y., grappling with the thirty most important things in the universe.

These are the currently known elementary particles of nuclear physics—the protons, neutrons and electrons and the more recently discovered particles like neutrinos, mesons and muons. Physicists study the minute and often ephemeral sub-atomic particles by bombarding atoms with protons or electrons given tremendous energy in giant accelerators, or atom smashers.

At the present stage of human knowledge these particles and their interactions are believed to be the basis for all physical matter and all energy. The knowledge of them for which physicists are groping would thus sum up the physical universe. No one believes science is at all close to that goal, but considerable progress was reported in Rochester last week toward understanding more of the bits and pieces of the vast puzzle.

Tenth Meeting

The scene of these developments was the tenth International Conference on High Energy Physics, which brought many of the elite in the world of nuclear physics to the University of Rochester campus. The conference originated in 1950 under the leadership of Dr. Robert E. Marshak, chairman of the Department of Physics and Astronomy of the University of Rochester.

The physicists who came here from more than thirty nations devoted their days—and often much of their nights—to reporting and discussing progress in the study of the atomic nucleus. Particular emphasis was placed on the phenomena that manifest themselves at high energies.

These manifestations include the production of some of the more exotic of the fundamental particles by accelerators. The accelerators are, in a sense, the microscopes of nuclear physics. The reactions they produce as nuclei are split or distorted allow physicists to infer details of the inner structure of the atomic core and its constituents.

The energies attained by accelerators have increased sharply in recent years, as shown in the chart below. The two newest measure about two miles across and accelerate particles to tremendous energies of about 30,000,000,000 electron volts (30 BEV).

Nevertheless, an informal international committee which met here to assess the future of accelerator research concluded that it would be both feasible and desirable to build giants in the 100 to 300 BEV range. The cost of such a project was estimated to be about $200,000,000 to $500,000,000.

New Description

One report at the conference dealt with a new description of the proton. With an accelerator which pushes electrons to energies of about a billion electron volts, Dr. Robert Hofstadter of Stanford University was able to discern a new detail in the structure of the interior of the proton. It is a "soft" and "spread out" cloud of magnetism surrounding a sharp and perhaps point-like core of electric charge, as he explained it this week.

The work by R. G. Glasser and his colleagues at the Naval Research Laboratory, who defined a new physical constant by measuring the fleeting lifetime of the pi zero meson, was also done with an accelerator. The lifetime, the shortest yet found for any elementary particle, was very roughly that fraction of a second represented by a 2 preceded by fifteen zeros (.0000000000000002).

This lifetime figure, which is expected to give scientists one more primary clue to the behavior of the atomic nucleus, was also calculated through indirect means by Dr. A. V. Tollestrup of the California Institute of Technology.

Among the most important developments which result from a meeting of this type are matters extremely difficult for a layman to appreciate.

Among these are a large-scale and long-range cooperative program to catalog the possible interactions between two protons. The purpose of this difficult and time-consuming work, in progress for decades, is to promote understanding of a basic reaction of nuclear physics even in the absence of any clear theory which can predict the results of all proton-proton interactions.

Even less easily comprehended but fully as important is the theoretical work which is bridging parts of the gap between such basic concepts of physics as the relativity and quantum theories and the behavior of the elementary particles.

How Elementary?

An implicit, though not often debated, feature of the whole meeting was the question of how elementary the elementary particles really are. At high enough energies, either in accelerators or in the natural atom-smashing events produced by cosmic rays, the elementary particles can be transformed into other particles or even groups of them. There are cases in which the pieces that result from the split of one elementary particle have greater mass than the original, the difference being made up by the energy which previously bound the components together.

The New York Times
Robert E. Marshak, who organized physics talks.

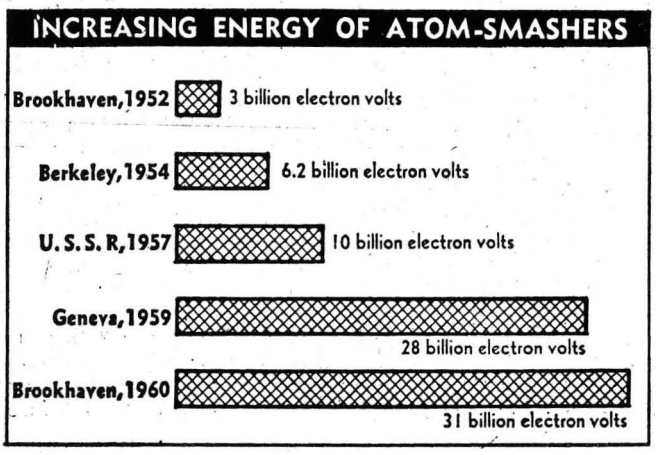
Such details, among others, have led physicists to question whether the future of their science would be best served by continued emphasis on the elementary particles or by changing the emphasis toward the underlying basic symmetries of nature—such as conservation of electric charge, of energy and of mass. In this way also the conference may have helped determine the future course of physics.

The conference, known familiarly as the Rochester conference because it spent its first seven years here, will no longer be held annually. Its organizers decided this week that the growing complexity of physics research makes a meeting every two years more realistic. The next meeting is scheduled for July, 1962, in Geneva.

SCIENCE NOTES: COSMIC RAY

COSMIC RAY—

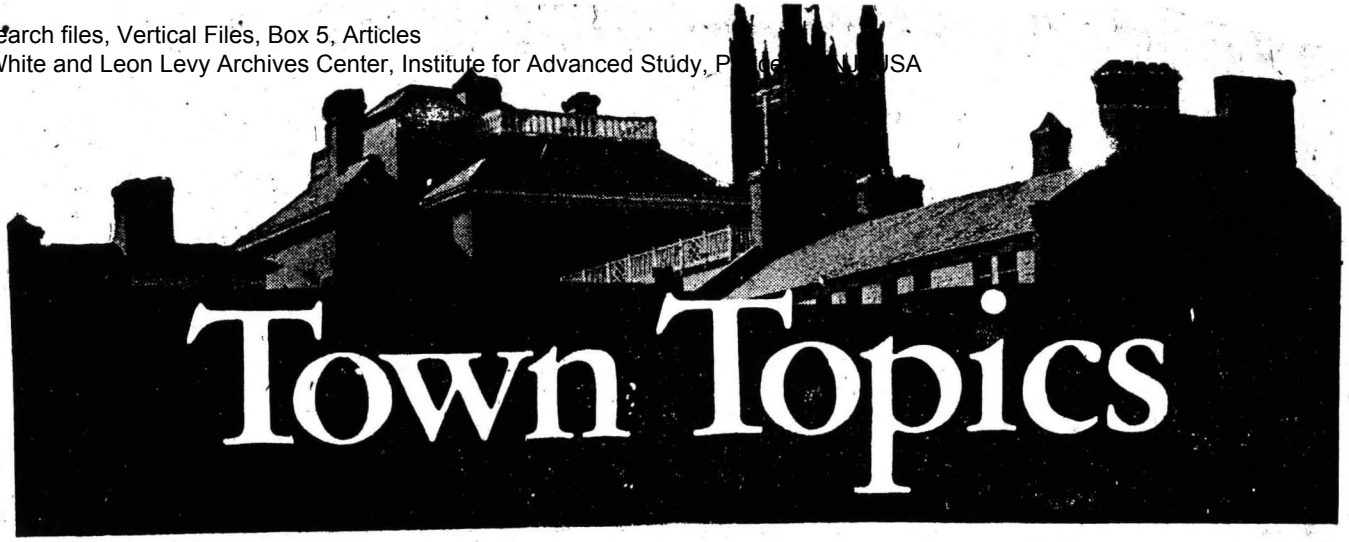
A cosmic ray shower believed to be the most powerful ever observed was reported last week by the Massachusetts Institute of Technology. It is believed to have stemmed from a primary cosmic ray particle which had an energy of between twenty and forty billion billion electron-volts—more than 500,000,000 times the energy capability of the world's most powerful atom smasher. By the time the cosmic ray particle's cascade of daughter products reached the ground it totaled some ten billion sub-atomic particles. Cosmic ray showers are caused by the collision, extremely high in the earth's atmosphere, of an incoming cosmic ray particle with the nucleus of an atom of the atmosphere. The incoming primary particle can be a proton —the stripped down nucleus of a hydrogen atom—or the nucleus of a heavier atom. Such primary particles are moving almost at the speed of light when they reach the earth's atmosphere. The event was recorded on Dec. 3, 1959, at the institute's research station near Albuquerque, N. M., by Dr John Linsley and Dr. Livio Scarsi. Analysis of the event took several months.



DEEP FREEZE—

Experiments showing how living cells can be super-cooled considerably below the freezing point of water without being killed were reported last week to the Botanical Society of America. Yeast cells survived cooling to temperatures of around 5 degrees Fahrenheit in the experiments, 27 degrees below the freezing point of water. The long-range objective of this research is the preservation by cooling of living tissue for medical use.

It has generally been believed that formation of ice crystals causes cell death at extreme low temperatures. But Dr. Peter Mazur of the Biology Division of Oak Ridge National Laboratory said his experiment indicates that cells can be kept alive if a medium in which they are placed is super-cooled without the actual formation of ice crystals. Lack of ice crystals around the cells also inhibits formation of ice crystals within the cell, and it is the internal ice formation that kills the cell, he said.



Town Topics

WE NOMINATE

George Frost Kennan, possibly this country's most respected career diplomat and a full-time Princetonian for the past decade, who has returned to the world-stage as President John F. Kennedy's Ambassador to Yugoslavia, "one of the sensitive centers of developing conflict within the contemporary Communist sphere." At a time when the United States is more deeply concerned with giving others a better understanding of our national aspirations than it has been in the past, the official re-appearance of the 56-year old Kennan (57 on February 16th) has been warmly welcomed editorially both in this country and in the "free press" of the NATO nations.

The architect (as the heralded "Mister X" of 1947) of the Truman Administration's policy of containment for halting the expansion of the Soviet Union, and an influential figure in shaping official attitudes of the Western World towards Moscow for the past 15 years, Kennan since his expulsion in 1952 as American Ambassador to Russia—for allegedly "slandering" the Soviet Union—has been headquartered here at the Institute for Advanced Study. His years of inactivity as a government spokesman have been highlighted by a series of noteworthy contributions to the cause of scholarship, including his award-winning volumes on Soviet-American Relations and the Stafford Little Lectures he gave at Princeton University in 1954.

"Articulate forthrightness" is characteristic of Kennan's approach to world affairs. Some seven years ago, here in the University's Alexander Hall, he stirred lecture audiences by urging them to recognize "the full solemnity of our obligation as Americans of the 20th century." This past week, shortly before his appointment to Belgrade was front-paged, he didn't hesitate to lash out at Moscow for imprisoning literary collaborators of novelist Boris Pasternak, declaring the sadness of those "who have hoped and worked for the moderation of the political differences that have so tragically divided Russia from the Western World."

Kennan, Eastman Visiting Professor at Oxford University (England) in 1957-58 and a former alumni trustee of Princeton University, entered the Foreign Service upon completing his Princeton undergraduate studies in 1925. Early in his career, while assignments carried him to Switzerland, Germany and the Baltic States, he voluntarily "majored in" Russian, and in 1933, when America resumed diplomatic relations with Russia, he accompanied William C. Bullitt to Moscow. Twice in the 1940's he was to return to the Russian capital as minister-counselor to two Ambassadors, W. Averill Harriman and Bedell Smith, the latter President Eisenhower's World War II Chief of Staff.

One of the few American diplomats who speaks Russian fluently, Kennan has supplemented decades of practical experience with quiet meditation and intensive historical research. The insights he gained as head of the State Department's Policy Planning Staff in the early 1950's, before he occupied the U.S. Embassy in the shadows of the Kremlin, have been sharpened by his researches. The implications of his brilliant volume, "Russia Leaves the War" (World War I), which earned a Pulitzer Prize in 1957, are quite clear: the Russian question currently harassing the modern world dates back to 1917, not to the fall of 1945 when all seemed bright in the Western World.

For understanding that in statesmanship "it is only right principles, consistently applied—not the gift of prophecy of the pride of insight—that achieve the best results"; for his capacities for understanding the problems of the emergent nations; for strengthening hopes that the new administration in Washington is reaching out for "new frontiers"; he is Town Topics' nominee for

PRINCETON'S MAN OF THE WEEK

THE NEW YORKER

THE TALK OF THE TOWN

Notes and Comment

AN autumnal mood possesses us. We sense approaching winter in the chilly wind that issues from our ventilator and flutters the newspaper clippings on our desk. Most of these items appeared in the brave green days of summer and have now turned a fine seasonal yellow. They rustle on our blotter and pile against our books, and

we cram them by handfuls into the wastebasket. Crises, threats, alarms, and mistakes, they all pack down together, compost for another year's rank growth of headlines.

Some few summer cuttings we mean to press among the pages of a large dictionary. We would not willingly part with an account of the first two-way conversation ever to be reflected off the moon. The first words to bounce off that distant, awful surface were "Hi, Walt." And we mean to keep a report of the troubles of the New Jersey Highway Authority, which requires its toll collectors on the Garden State Parkway to courteously thank all motorists for their money. Unused to any such civility, the drivers commonly proceed several dozen yards before the message sinks in, whereat many of them, in evident astonishment and delight, back up to say "You're welcome," and thus greatly hinder the flow of traffic. And now there comes dancing down the indoor breeze an article dealing with a new ball-point pen that was engineered by the Parker Pen Company. A judicious admixture of diamond dust on the point, the firm declares, renders the pen capable of withstanding "all the pressures of writing." This visionary statement, we trust, will be greeted with charity, as well as frank skepticism, by all writers.

One more summer item and our desk is clear for the new season. It concerns a billboard erected by the National Biscuit Company out in Syracuse. This billboard plays music at passersby, the volume being such that it "can be heard in a passing car whose windows are closed." Judged strictly as an attempt to make life unendurable in Syracuse, the sign does not appear to be an immense success. Only five complaints were mentioned in the clipping, the most serious of which came from "an elderly lady living five hundred yards from the sign." We find her objection unreasonable. If the music is to be heard through the windows of a car, it stands to reason that it must also be heard through the windows of a house, and we would ask the complainant bluntly, man to little old lady, whether she would really prefer to live in peace and quiet if it meant interfering with the right of an American firm to make money by any method it chooses. Besides, why should the company forbear to serenade its customers when it does not hesitate to warble at its own employees? For the whole idea behind the sign, we gather, is to impress the public with the fact that Millbrook Bread is "baked to the accompaniment of music," on the theory, presumably, that music hath charms to soothe the savage yeast.

Connections

WE'VE just come away from a breakfast talk with Professor Werner Heisenberg, the theoretical physicist and Nobel Prize winner who directs the Max Planck Institut für Physik und Astrophysik in Munich, and if we seem addled it is because we've been thinking about the Professor's staggeringly abstruse world—a world made up of the properties, actions, and interactions of the thirty known elementary particles, which are believed to hold the solution to the matrix riddle of the universe. Convinced that we should contemplate the cosmos as little as possible, we'll begin by telling you that Professor Heisenberg turned out to be a stocky man in his late fifties, with a pink, cherubic face, merry blue eyes, a reassuringly mischievous smile, and a halo of gray hair splaying out from the sides of his head and giving him the appearance of a kindly concert impresario. Sitting down to orange juice, coffee, and a piece of toast with marmalade, he glanced at our plate of scrambled eggs

and bacon and told us that small meals enhance one's powers of concentration. "Such breakfasts you Americans eat!" he said. "I am always amazed." Professor Heisenberg's amazement at American breakfasts, we thereupon learned, goes back to 1929, when he spent two terms lecturing at the University of Chicago, and visited the West Coast; in 1932—the year he won the Nobel Prize, for his work in quantum mechanics—he returned to lecture at the University of Michigan; and in 1939 he taught at M.I.T., and again at the University of Chicago. "So, you see, I am not a stranger," he said. "I feel quite at home here."

Professor Heisenberg went on to tell us that he has also visited the United States several times since the Second World War, and that during his present stay he attended the Tenth Annual International Conference on High Energy Physics at the University of Rochester, where he reported on his Non-Linear Spinor Theory of Elementary Particles. At this point, we pushed our American breakfast aside, gulped coffee to clear a mind that had begun, defensively, to

"If you disagree with me, dear, why don't you just say so?"

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anesthetize itself, and asked about the Non-Linear Spinor Theory. Professor Heisenberg nibbled at his piece of toast and smiled. "It's an attempt to formulate a law that will explain and predict the masses and characteristics of all the elementary particles," he said. "Spinor is a mathematical quantity discovered thirty years ago by Dirac and Pauli. It refers to the spinning motion of Fermion particles as they move about in orbits—a motion similar to that made by the earth as it moves around the sun. The term 'non-linear' describes big interactions between sub-atomic particles called nucleons that result in the complicated phenomena of creation, exchange, and absorption of pairs of protons and anti-protons or of neutrons and anti-neutrons. I am convinced that the symmetry principles that must govern particle interactions hold the secret of the nucleus. If all this seems difficult to visualize, you must understand that the world of the atom is one of probability, rather than certainty."

Getting back to certainty, we asked Professor Heisenberg to tell us about his life in Munich. "Aside from physics, my chief interest is music," he said. "I love music, and so do my children; I have seven. Our whole family plays chamber music together. I myself play the piano." With a pleased smile, he added, "I might tell you that when the Institut was moved from Göttingen to Munich, last year, we performed together at the dedication ceremonies." Music and physics have properties and characteristics in common, the Professor remarked. "You see, it is really a harmonic world," he said. "The trouble is that we have split it into too many complex details. People are confused today. They have lost the sense of harmony that underlies everything. They do not see the big connections." According to Professor Heisenberg, the big connections in the world of high-energy physics are to be deduced not from the properties of the elementary particles but from the relationships between them. "The particles in themselves are not fundamental," he said. "Experiments conducted in the accelerators at Brookhaven, Berkeley, and Geneva provide valuable information about the phenomena of the particles, but such details interest me only as they give clues to the whole. Some physicists start by concentrating on detail. For myself, I must start not from detail but from a general connection, a feeling I have about the way things should be." He held up a cupped hand and revolved it slowly. "To understand nature, we must make order out of phenomena," he said. "We must take the data, hold them up to the light, and then make a turning point by formulating theories and expressing them in mathematical equations." In Professor Heisenberg's case, understanding and solving the equation that expresses the Non-Linear Spinor Theory has taken two years of intensive work. "There are still difficulties in the mathematics and some unanswered questions, but I believe that my equation is essentially the right one," he told us. "It may take years to prove, but I will give it up only at a very late stage, or if some new experimental data should force me to admit I have been wrong. It is possible, of course, for anyone to be wrong."

We asked Professor Heisenberg if the Rochester conference had provided any developments that would substantiate his belief in the equation, and he said that there had been some encouraging signs, but that breakthroughs are not achieved simply. "I will tell you a story that illustrates how we physicists can sometimes make progress," he went on. "At this conference, Yoichiro Nambu, of the University of Chicago, read an interesting paper concerning a theory of elementary particles suggested by superconductivity—a baffling phenomenon of solid-state physics, which is a field entirely different from my own. Superconductivity occurs in certain metals that lose electrical resistance at extremely low temperatures. In working out some of the problems posed by this phenomenon, Nambu has encountered mathematical difficulties similar to those confronting me in the Non-Linear Spinor Theory. Perhaps these puzzles that seem so different are related. Perhaps, through cross-research, we can achieve some enrichment of our mathematical tools that will enable us to go on more easily. Our Russian colleague Nikolai Bogolyubov is interested in the apparent link between Nambu and me. So now we must try very hard to find this link. The mathematics will be enormously complicated, but this is a usual challenge." Professor Heisenberg again cupped his hand and revolved it. "I am convinced that the universe is connected by a truly simple law," he said, "and that if we can only do things well enough, everyone will see the kind of understandable world we live in."

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GASTRO-INTESTINAL INTELLIGENCE: Saul's Dairy, at 114th Street and Broadway, is selling, for forty-three cents, eight ounces of something labelled "Pork Salut," and we don't want to know what it is.

Junior Museum

WE borrowed a child the other Saturday morning and went to the Metropolitan Museum of Art's Junior Museum, which was holding an open

LOOK JUNE 7, 1960 / VOLUME 24, NO. 12

Hiroshima: the DECISION *that changed the world*

By FLETCHER KNEBEL and CHARLES W. BAILEY II

THE United States cruiser *Augusta* cut through the warm summer waters of the Atlantic. It was taking President Harry S. Truman home from the Potsdam Conference, where he and the British and Soviet leaders had discussed their plans to end World War II.

Two days out of Newport News, Va., on the evening of August 5, 1945, Truman joined the ship's officers for dinner. Over dessert and coffee, the ship's doctor asked a question that had been on the minds of many of the *Augusta's* officers: Had any commitments been made at Potsdam to bring Russia into the Pacific war and thus hasten the fall of Japan?

The President responded with a statement his listeners would never forget. No, he said, no such deal had been made. And if the Russians had been somewhat difficult at Potsdam, it did not matter as far as the war against Japan was concerned. The United States had now developed an entirely new weapon and did not need Russia—or any other nation.

"It is equal to 20,000 tons of TNT exploded on a single target at one time," he said. The new weapon had been developed in total secrecy and financed entirely by a Presidential emergency fund, he added. Congress knew nothing about it. It had been tested, and reports indicated that it could end the war.

As he rose to leave, the President turned back for a moment.

"It is the biggest gamble in history," he said. "Two billion dollars have been spent on it. We will have the final answer on its effectiveness in a very short time."

For a moment, Harry S. Truman had given some relatively junior officers an awesome glimpse of the authority and responsibility of their Commander in Chief. The authority, in many matters, was absolute; the responsibility was crushingly final.

The decision he had made a few weeks earlier was about to destroy the hearts of two cities, kill 152,000 people and change the history of the world.

Was it the right decision?

It had been a long time in the making. On September 18, 1944, President Franklin D. Roosevelt and British Prime Minister Winston Churchill had approved an *aide-mémoire* about the still unperfected atomic bomb. It said: "When a bomb is finally available, it might, perhaps, after mature consideration, be used against the Japanese. . . ."

The two men apparently assumed that the bomb would be developed too late for use against Germany, which was already reeling under the blows of the Allied armies.

During the first years of the long and costly experiments that produced the bomb, there seemed to be general agreement that any weapon that might shorten the war should be employed as soon as it was available. But gradually in late 1944 and early 1945, many scientists and six important military leaders in the United States began to feel strong reservations about this particular weapon. The story of these doubts among military leaders—and the reasons behind them—has never been told before.

The first prominent military man to question whether the bomb should be used was Adm. William D. Leahy, chief of staff to the Commander in Chief. Gen. Leslie Groves, head of the Manhattan District project that produced the bomb,

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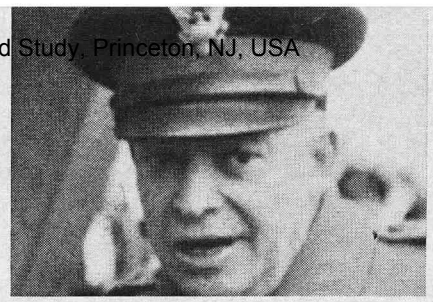
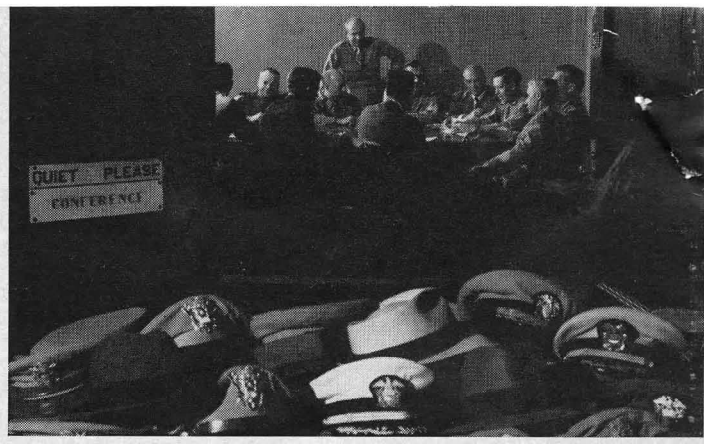




Eisenhower did not want the U. S. to use the A-bomb first

Five other American military leaders had reservations about the bomb

briefed Leahy on the new weapon in October, 1944. From that moment on, Leahy had two strong reservations about atomic weapons. First, he doubted that they would work. Second, assuming that they were perfected, he was repelled by the prospect of employing them. He made no effort to mask his feelings as an individual, but never in his official capacity as the top military officer of his country did he argue against using the bomb. Perhaps this was because he believed his task was to deal with purely military—not ethical—problems.

THE DEBATE BEGINS

Harry Truman got his first inkling of the decision that would be his only an hour after becoming President of the United States on the night of April 12, 1945. He took the oath at 7:09 p.m. and held a brief Cabinet meeting to assume the responsibility of office. As the Roosevelt Cabinet members filed silently out, Secretary of War Henry L. Stimson remained behind. He told Truman that the government he now headed was developing a weapon of enormous power.

A few days later, scientist Vannevar Bush gave Truman an extensive explanation. On April 25, 1945, Stimson wrote a lengthy report in which he said: "Within four months, we shall in all probability have completed the most terrible weapon ever known to human history."

Stimson suggested that Truman appoint a committee to advise him on atomic policy. The group was called simply the Interim Committee. In addition to Stimson and Bush, the members were: Ralph A. Bard, Under Secretary of the Navy; William L. Clayton, Assistant Secretary of State; Karl T. Compton, chief of the Office of Scientific Research and Development field office; James B. Conant, chairman of the National Defense Research Committee and president of Harvard; George L. Harrison, special consultant to Stimson, and James F. Byrnes, later Secretary of State. Working with the group was an advisory panel made up of scientists Arthur Compton, Enrico Fermi, Ernest O. Lawrence and J. Robert Oppenheimer.

The Interim Committee had more to do with Truman's decision to use the bomb than any other group, although the final word was his alone.

Those attending a meeting of the Interim Committee on May 31, 1945, vigorously discussed the proposal to use the bomb against Japan. Gen. George C. Marshall, who was sitting in with the committee, asked whether the bomb could be kept a secret, thus concealing America's defense hand in the future. The scientists in the group said no. Too many men in other countries knew too much about the prewar experiments with the atom. Sooner or later, the full secret would be discovered in other countries.

Arthur Compton asked about the possibility of a bomb demonstration before foreign observers. Would this convince the Japanese to surrender?

Other members of the committee debated this question. What if the demonstration bomb were a dud? What if the Japanese refused to send representatives to see the new weapon?

Another suggestion was offered. The Japanese could be warned explicitly of the murderous scope of the new bomb, and then be given a stated number of days to surrender. They could be told that the bomb would be used only if they refused to lay down their arms. But there were objections to this idea too. What if the Japanese reacted by moving Allied prisoners of war into key areas, and then dared the United States to go ahead? Or what if they concentrated fighters to intercept the atomic-bomb planes?

In the end, the committee decided that there was only one way to end the war quickly and save the lives of thousands of American fighting men. It recommended that the bomb be dropped on Japan as soon as possible, without specific warning. The target should include both a military installation and surrounding houses and buildings susceptible to maximum blast damage. The realization that many civilians would be killed was implicit in this last point.

TENTATIVE PEACE FEELERS

The recommendation was given to Truman on June 1. He said he had been thinking about the problem and had reached the same conclusion. Much as he regretted it, he said, he must order the bomb used. From that moment, Government machinery moved swiftly to assemble and deliver the weapon. Maj. Gen. Curtis LeMay, then commander of the 21st Bomber Command, was asked to suggest three relatively untouched cities as possible targets. This was considered essential if the atomic bomb was to make the maximum impression on the Japanese. LeMay radioed back: Kyoto, Hiroshima and Niigata, in that order.

But for a while, it seemed that Truman's decision might not have to be implemented. During that same month, two Japanese officials of the Bank for International Settlements in Basel, Switzerland, approached a Swedish economic adviser at the bank. They asked this adviser, Per Jacobsson, to talk to an American friend of his, Allen W. Dulles, European director of the Office of Strategic Services, the American intelligence agency. The Japanese wanted Jacobsson to find out from Dulles whether the United States might be willing to offer conditions that would make a Japanese surrender possible.

The Japanese bank officials, Kojiro Kitamura and Tsuyoshi Yoshimura, had some influence among top diplomats and military leaders in Japan, and the Japanese minister to Switzerland, Shunichi Kase, had agreed to support and assist them. They had also enlisted Lt. Gen. Seigo Okamoto, former military attaché in Berlin, who thought he could convince the Army General Staff in Tokyo of the necessity of surrender.

Kitamura and Yoshimura proposed through Jacobsson that the "unconditional surrender" demand of the Allies be softened. Among the concessions they suggested were: retention of Hirohito as Emperor of Japan; no Allied insistence upon changes in the Japanese Constitution; continuation of Japanese control over Formosa and Korea; internationalization of Manchuria.

TOKYO HAD OTHER PLANS

Jacobsson went to Wiesbaden, Germany, on July 14 to discuss these proposals with Dulles. Dulles, aware that he had no formal authority to speak for the United States, was cautious and skeptical, but he worked out a suggested reply. The gist of it was that while there would undoubtedly be sympathy for the desire to retain the Emperor, there could be no advance commitment by the U.S. Government on this point. The best way Hirohito could insure his continuation as ruler was to take the lead in proclaiming and enforcing the surrender.

While Jacobsson returned to Switzerland to give the Japanese Dulles's reaction, Dulles himself decided to go to Potsdam, Germany, to tell Secretary of War Stimson of the Japanese overtures. Stimson noted the conversation in his diary, but did not indicate to whom, if anyone, he communicated the news.

The Japanese in Switzerland sent strongly worded telegrams to the Foreign Office and Army General Staff in Tokyo, but received no encouragement from their government.

The Japanese Cabinet was already exploring other means of ending the war. On July 11, 1945, a "very secret" cable was sent to the Japanese ambassador in Russia: "The foreign and domestic situation for the Empire is very serious, and even the termination of the war is now being discussed privately. Therefore . . . we are also sounding out the extent to which we might employ the U.S.S.R. in connection with the termination of the war. . . ."

The U. S. Government knew of this message almost as soon as the Japanese ambassador in Moscow. The cryptographers of the U. S. Navy had long before broken the Japanese codes. The message was forwarded to Truman, who was then en route to Potsdam. At the conference, Joseph Stalin reported the vague Japanese peace feelers to Truman.

The President, in turn, told Stalin of the atomic bomb with studied casualness. He was prepared to deflect the volley of questions he expected Stalin to ask, but the Russian dictator seemed unimpressed. He smiled and said he hoped good use would be made of it. "He never asked a question," Truman said later.

Back in the United States, the debate on the use of the bomb was widening during June and July. On June 11, seven scientists presented a report to the Secretary of War, opposing use of the bomb. "If the United States were to be the first to release this new means of indiscriminate destruction upon mankind, she would sacrifice public support throughout the world," they said.

The four-man science panel of the Interim Committee continued its discussion of whether a demonstration of the bomb was feasible. Lawrence pressed hardest for this. But in the end, all four agreed: "We can see no acceptable alternative to direct military use."

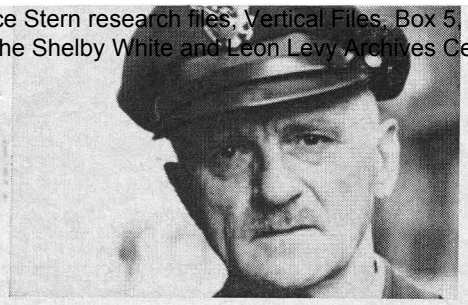
Two days after receiving that report, Truman summoned the chiefs of staff of the armed forces to the White House to work out final strategy against Japan. General Marshall described the plan to invade the Japanese home island of Kyushu on November 1, 1945, with a total force of 766,700 men. Adm. Ernest King said he thought U.S. casualties in the first month would be between 31,000 and 41,700. The Kyushu invasion would be followed in the spring of 1946 by a landing on the Tokyo plain.

NEW QUESTIONS ARE RAISED

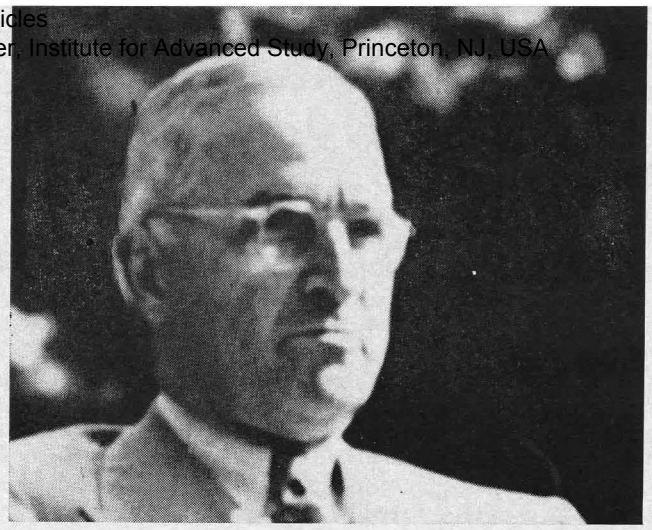
Some officials lingered after the meeting. One of these was Assistant Secretary of War John J. McCloy. He said that the Japanese should be warned before the atomic bomb was used, but his suggestion found no support.

Under Secretary of the Navy Bard had been having second thoughts in the 26 days after he joined the other members of the Interim Committee in urging quick use of the bomb. In a memorandum, he wrote: "I have . . . a feeling that before the bomb is actually used . . . Japan should have some preliminary warning for, say, two or three days in advance. . . . The Japanese Government may be searching for some opportunity . . . for surrender. . . . It seems quite possible . . . that this presents the opportunity. . . ."

Rear Adm. Lewis L. Strauss, a consultant on atomic matters, argued that



Gen. Carl Spaatz demanded written orders for the mission



But Truman had already made up his mind— and never wavered

residents of an area near Nikko could be warned to evacuate and that a cryptomeria forest there could be used to demonstrate the effect of blast and heat.

Later, Gen. Harold (Hap) Arnold, commander of the Army Air Force, added a new argument. He said the bomb was not needed to win the war because conventional bombing, coupled with the blockade, had already brought the Japanese Empire to its knees.

While Truman and his top advisers were at Potsdam, the bomb was tested near Alamogordo, N. M. The flash lighted the skies 250 miles away. A false news report was released by Manhattan Project officers, indicating that "an ammunition-magazine explosion in a remote area of the Alamogordo Air Base reservation" had caused the blast.

The day after the test, 67 scientists petitioned Truman not to use the bomb against Japan without advance warning.

At Potsdam, Stimson argued for a change in the list of target cities. He felt that Kyoto, the ancient capital of Japan, famous for its Buddhist monasteries, should be removed from the list. After some discussion, the final targets were named: Hiroshima, Kokura, Niigata.

Stimson briefed Gen. Dwight D. Eisenhower, the supreme European commander, on the new weapon. Eisenhower said frankly that he hoped the bomb would not have to be used on Japan, because he hated to see the United States become the first nation to employ a weapon with such incredible potential for death and destruction.

THE SIX WHO QUESTIONED

Thus, in the weeks in which the bomb was discussed by the few hundred people who knew of its existence, six U. S. war leaders had expressed reservations about it: Admiral Leahy, Generals Arnold and Eisenhower, Rear Admiral Strauss, Assistant Secretary of War McCloy and Under Secretary of the Navy Bard.

On the other side, a score of influential White House advisers supported the use of the bomb, including Secretary of War Stimson, Generals Marshall and Groves, seven of the eight members of the Interim Committee, the four scientists who advised the committee, and many other top scientists.

But whatever the ruling of history on its wisdom, Truman's decision was made. Now started the crucial chain of events to carry it out.

In Washington, Gen. Carl Spaatz received verbal orders to undertake the first atomic-bombing mission, but felt these were inadequate.

"Listen, Tom," Spaatz told Gen. Thomas T. Handy, acting chief of staff of the Army, "if I'm going to kill 100,000 people, I'm not going to do it on verbal orders. I want a piece of paper." Handy argued that as little was put in writing as possible on the Manhattan District project, to minimize the chances of breaking security. But finally he told Spaatz, "I guess I agree. If a fellow thinks he might blow up the whole end of Japan, he ought to have a piece of paper." Spaatz received his written orders.

A messenger arrived from Potsdam with the name of one more city to be added to the target list: Nagasaki. A general contended that Nagasaki's hilly terrain made it unsuitable for a demonstration of the atomic bomb's power. His objections were overruled.

A NEW DANGER

As Truman journeyed home from Potsdam, a flight surgeon on distant Tinian Island puzzled over the word "radiation." He was Lt. Col. Harold A. (Spike) Myers. He had three callers on the night of August 4—men attached to the recently arrived 509th Composite Group.

"We could have one hell of an explosion here in a couple of days," one of the men told Myers. "If that happens, don't send any first aid into the area before it's been tested for radiation. Otherwise, the people who go in may die too. We just don't know."

Two of the men pulled out a case of measuring instruments and explained them to Myers. If they indicated radiation above a specified level, they said, he was to keep everybody out of the crash area. All over Tinian Island, somewhat similar oblique conferences took place that week about the bomb, which was referred to as "Little Boy."

Little Boy didn't appear outwardly strange for a weapon that was about to revolutionize warfare and raise a question mark about civilization itself. It was in a familiar steel bomb casing about 14 feet long and about 5 feet in diameter. It weighed just under 10,000 pounds.

Inside, the bomb's proximity fuse was set to touch off an explosive charge in the tail when the bomb dropped to 1,850 feet above ground. This in turn would shoot a small chunk of U-235 forward at 5,000 feet per second. In the nose, surrounded by heavy metal, was a small cup of U-235. The hurtling chunk, shaped to fit the cup exactly, would strike the forward piece of U-235. At that instant, within a space of time too small to measure, the atomic explosion would occur.

The U-235 had been shipped to Tinian on a carefully worked out schedule that had gone into effect three weeks before—in the second week of July. Maj. Robert R. Furman had flown to Los Alamos to receive instructions from Oppenheimer about his most important assignment of the war. He and Dr. James F. Nolan, who was then serving as hospital physician at the laboratory, were to take a top-priority shipment to Tinian. The mission was vital, because if anything happened to the piece of uranium they were carrying, the bombing would be delayed for weeks. No replacement was in sight. The orders were explicit: If the U.S.S. *Indianapolis*, the heavy cruiser that was taking them to Tinian, were to sink, the U-235 was to have the first motor launch or life raft. Under no circumstances were they to save a life before saving the U-235.

Furman and Nolan kept four-hour alternate watches beside their cargo, a heavy cylinder about 18 inches in diameter (which contained the U-235). On the deck of the ship, a long crate had been stowed. It held one of the three alternate cases for Little Boy.

On July 26, the *Indianapolis* dropped anchor at Tinian. The cylinder and the crate were safely lowered to an LST and a motor launch. Four days later, the ill-starred cruiser was torpedoed and sunk.

Later atomic-bomb shipments almost came to grief. One plane carrying fissionable material lost an engine, sprang a gas leak and flew through a tropical storm that forced rain between the fuselage joints. But no shipment was lost.

By the end of July, practice bomb runs were being carried out regularly. Since these consisted of a single plane dropping bombs on unexpected targets, the Japanese were confused. On July 20, Radio Tokyo complained:

"The tactics of the raiding enemy planes have become so complicated that they cannot be anticipated from experience or common sense. . . . The single B-29 that passed over the capital this morning dropped bombs on one section of the Tokyo metropolis, taking the people of the city slightly unawares. . . . These are certainly so-called sneak tactics aimed at confusing the people."

While these practice runs continued, General Spaatz flew to the Philippines to brief Gen. Douglas MacArthur on the atomic bomb. It was not a pleasant mission for Spaatz. A weapon of epic proportions had already been sent to the Pacific — where MacArthur was commanding general of ground forces—and MacArthur was one of the last commanders to be informed about it. If his pride was hurt, he did not show it. He listened intently and said, "This will completely change all our ideas of warfare."

THE ORDERS ARE ISSUED

War Department representatives met with LeMay to make the final plans for the attack. Niigata was eliminated from the list of targets because it was too distant and too small. It was agreed that seven planes would be involved in the striking force. Three B-29's would leave early to take stations over Hiroshima, Kokura and Nagasaki. They would report weather conditions in the three cities to Col. Paul W. Tibbets, Jr., pilot of the plane destined to drop the first atomic bomb, and also to Guam and Tinian. Tibbets would have time while approaching Japan to select the city best suited for a visual drop.

Two B-29's would escort Tibbets to the target. One would carry scientists to measure the blast, and the other, photographers. A seventh plane would stand by on Iwo Jima, halfway between Tinian and Japan. If Tibbets's plane developed engine trouble, the stand-by plane could take over.

Top-secret field orders, issued August 2, spelled out the details for the flights. Planned for elimination in Hiroshima—

continued

. . . and General MacArthur was among the last to know

the primary target—were the Ube Nitrogen Fertilizer Company, the Ube Soda Company, the Nippon Motor Oil Company, the Sumitoma Chemical Company and the Sumitoma Aluminum Company.

On August 4, Capt. William S. (Deac) Parsons, the Navy officer chosen to assemble the first atomic bomb used in war, showed the flight crews movies of the test atomic blast in Alamogordo. He said frankly that no one could be sure exactly what would happen at Hiroshima. Perhaps, he said, even exploding at 1,850 feet above ground, Little Boy might crack the crust of the earth. Pilots were warned not to fly through the cloud made by the explosion, because of the danger of radioactivity. Some of the men whispered of the possibility of sterility, the bugaboo of servicemen since the invention of radar.

Tibbets had a quiet sense of history. He realized that the plane he was about to fly might be remembered for generations. It had always been called simply by its serial number, but now he thought of a name both distinctive and with a special meaning to him: *Enola Gay*. This was his mother's name. His bombardier and his navigator had met his mother and agreed to his choice.

On the evening before the historic flight of the *Enola Gay*, Captain Parsons drew aside Brig. Gen. Thomas Farrell, a top assistant to General Groves. He mentioned several recent take-off crashes by B-29's. "If that happens tomorrow morning," he said, "it could cause a nuclear explosion and blow up half the island."

"I know," Farrell said. "But what can we do about it?"

"If I put off the final assembly until after the take-off, the island wouldn't be in any danger in case we crashed."

"You've never done such a job," Farrell said. "Do you know how?"

"No," said Parsons, "but I've got all day and night to learn."

"O.K., Deac. Go ahead and good luck."

EXPERIMENT IN DARKNESS

Two months earlier, Parsons had considered a proposal to arm the bomb in flight. Groves, Oppenheimer and Parsons himself had vetoed the idea, fearing it would be too easy for something to go wrong. But the man who made the proposal—Lt. Comdr. Francis Birch, who had helped design Little Boy—had developed a "double plug" system on his own. This permitted the conventional explosive to be inserted in the bomb while the plane carrying it was in flight. Without this explosive charge, the two pieces of U-235 could not be driven together. Separated, there was no danger of an atomic explosion, even under crash conditions.

Now, Parsons decided to experiment with the double plug. He worked in the stuffy heat of the *Enola Gay*'s bomb bay all that afternoon and into the evening. There was just enough room for him to squeeze into a squatting position behind the bomb. He practiced working in the dark of the bomb bay with only a flashlight. That evening, when Farrell stopped by to check on the progress, Parsons's hands were black and bleeding from handling the sharp-edged parts.

"For God's sake," said Farrell, "let me loan you a pair of pigskin gloves."

"I wouldn't dare wear them," said Parsons. "I've got to feel the touch."

Parsons and Birch had developed a lubricant heavily loaded with graphite for the bomb's double plug. It blackened Parsons's hands, and he couldn't get them clean. As he joked about going over Japan with "dirty hands," Birch noticed that this bothered him more than any other phase of the task.

At last, Parsons announced himself satisfied and ready to do the job in flight the next day. It was agreed that Birch and other scientists would stand by in the communications center in case anything went wrong and Parsons had to question them by radio.

While Parsons worked in the bomb bay, First Lt. Morris R. Jeppson and three other young lieutenants spent the day installing an electronic console in the crew quarters just forward of the bomb bay. The black box was about 30 inches wide and contained meters, lights and switches, each to monitor a separate item in the bomb. If the console showed a defect anywhere, the bomb had to be repaired before it could be dropped.

THE MISSION BEGINS

At 11 p.m. on Sunday, August 5, about 100 men trooped into a Quonset hut for the final briefing.

"We are going on a mission," said Tibbets, "to drop a bomb different from any you have ever seen or heard about. This bomb contains a destructive force equivalent to 20,000 tons of TNT."

At 1:37 a.m., with no fanfare, the three B-29 weather scout planes took off on separate runways. Maj. Claude Eatherly's *Straight Flush* headed for Hiroshima; Maj. Ralph Taylor's *Full House*, for Nagasaki, and Maj. John Wilson's *Jabbit III*, for Kokura.

A half hour later, searchlights played on the *Enola Gay*. Some 50 men gathered under the wings as Army photographers took pictures of the fliers, ground crew, plane and crowd. In addition to the nine-man crew, the *Enola Gay* would carry three special passengers: Parsons for the bomb, Jeppson for the black box and Lt. Jacob Beser for the radar scanning device.

Members of the crew besides Tibbets were Maj. Tom Ferebee, bombardier; Capt. Robert A. Lewis, copilot; Capt. Theodore (Dutch) Van Kirk, the navigator; T/Sgt. Wyatt Duzenberry, flight engineer; Sgt. Robert H. Shumard, assistant engineer; Sgt. Joe A. Stiborik, radar operator; Cpl. Richard Nelson, radio operator; Sgt. George (Bob) Caron, tail gunner.

All hands were uneasy. The civilians had not the slightest fear of the bomb, but worried whether the plane could make the long flight to Japan and back. The airmen had no qualms about the plane, but had no confidence in the huge bomb.

Down the runway went the *Enola Gay*, heading for Japan, where it was then 1:45 a.m., Monday, August 6. A few moments later, Capt. Charles F. McKnight's *Top Secret* rumbled off for its stand-by chores at Iwo Jima. Special Bombing Mission No. 13 was on the way.

The dozen men in the control tower jumped into waiting jeeps and drove three miles to the range shack, where voice radio contact could be maintained with the *Enola Gay* for the first 45 minutes of flight.

The group waited in vain for definite word from Tibbets. Static cut his voice into meaningless sounds. Then the plane faded out of range.

Out over the Pacific, the *Enola Gay* climbed to 4,000 feet. While Jeppson held a flashlight and passed him tools, Parsons carefully inserted the explosive detonating charge.

Again, Parsons's hands became black with the graphite lubricant, and he nicked his fingers on the sharply tooled steel edges. The entire job took only about 25 minutes.

"O.K.," Parsons told Jeppson. "That'll do it."

The bomb was now completely armed and ready to go. Parsons and Jeppson climbed out of the bomb bay into the forward crew compartment, and locked the door behind them.

Tibbets tried to nap in the after-compartment. He had been 24 hours without sleep. He kept his eyes shut for about fifteen minutes, hoping the vibration would lull him to sleep. It didn't. He returned to the cockpit.

Jeppson marked the strange beauty of the moon and stars as they flashed into view and then disappeared behind a cloud. Below, he could see the rippled ocean. All his life, he would remember the grandeur of the night as it stretched between Tinian and Iwo Jima.

Navigator Van Kirk estimated they would reach Iwo Jima and the rendezvous point with the other two planes at 4:55 a.m.

Lewis paused behind the black box. Tiny green lights glowed on the panel. "What the hell do those green lights mean?" he asked. They meant that all parts of the bomb were satisfactory, explained Parsons. When red showed on the console, it was time to worry.

A RECORD FOR HISTORY

McKnight landed his stand-by bomber on little pork-chop-shaped Iwo Jima and taxied to a point directly behind the specially prepared bomb pit. Now, if an emergency forced Tibbets to make for Iwo, the bomb could be unloaded and transferred to the *Top Secret* within a few minutes. A dozen M.P.s ringed the B-29. Curious G.I.s stood at a respectful distance and gawked.

As Tibbets set his compass course for the coast of Japan, two stripped B-29's flew the short hop from Guam to Tinian. In the briefing room at North Field, the pilots were given their instructions. They were to photograph an explosion of unprecedented size, but should not fly through the debris cloud. The secret weapon might be exploded over any of three cities, depending on the weather. They were to check by voice radio with the Iwo Jima control tower to see which city had suffered the blast. The camera-laden B-29's took off from Tinian four hours behind the *Enola Gay*.

Tibbets's formation headed for Japan on top of an undercast. Tibbets called all hands over the intercom. From here on in, he said, every man must be at his station. At the coast of Japan, Beser would begin recording the intercom conversation on green celluloid disks.

"This is for history," said Tibbets, "so watch your language. We're carrying the first atomic bomb." It was the first time that most of the crew had heard the phrase.

At 6:40 a.m., the *Enola Gay* began her climb from 9,000 feet to the bombing altitude of 30,000 feet. Parsons had his oxygen mask ready, in case the console showed something wrong and he had to climb into the bomb bay to remedy it.

Up ahead of the *Enola Gay*, Major Eatherly's *Straight Flush* approached the outskirts of Hiroshima at 7:09 a.m. The *Straight Flush* flew the identical course to be followed later by Tibbets. A solid undercast covered Japan as far as the eye could see. Minutes later, however, First Lt. Ken Wey, the observer-bombardier, saw the entire city of Hiroshima open up through his bomb sight. At the point where the *Enola Gay* would release its cargo, the city was so clear below that the crew could see patches of green grass.

HIROSHIMA IS DOOMED

After flying west for about 10 miles, the *Straight Flush* made a full turn and came back across the city. The cloud bank rimmed Hiroshima, but a great hole with a diameter of more than 10 miles marked the city as though fate had driven a spike into its heart.

At the same time, Major Taylor's *Full House* was high over the city of Nagasaki to the southwest. Nagasaki was fairly clear too, with only about 30 per cent covered by drifting clouds at 20,000 feet.

The *Jabbit III*, meanwhile, flew over Kokura, at 33,000 feet. Only a few clouds hovered on the flanks of the city.

All three target cities lay open for the *Enola Gay* that morning.

It was 7:25 a.m. when the *Straight Flush* left Hiroshima and headed for Tinian. At that moment, the *Enola Gay* was flying northwest over the Pacific. Tibbets had left his pilot's seat and was bending over Dick Nelson's radio table. He decoded from the scramble sheet as Nelson jotted down the letters and numbers sent from Eatherly's plane.

"Advice: Bomb Primary." Tibbets turned to Dutch Van Kirk, standing at his elbow.

"It's Hiroshima," he said. Tibbets had been instructed to fly over Hiroshima, regardless of what the weather reports indicated, on the chance that the city might be clear by the time he arrived. Now, however, he could forget about Kokura and Nagasaki and concentrate on a single city. Nelson later announced the weather messages from *Jabbit III* and *Full House*, but they were of academic interest only.

At 7:50 a.m., the automatic pilot was turned off, and Tibbets took over the manual controls. "We're about to start the bomb run," he announced on the intercom at 8:09. "Put on your goggles and place them up on your forehead. When you hear the tone signal, pull the goggles over your eyes and leave them there until after the flash."

Each of the twelve men aboard had been supplied with goggles that resembled those worn by arc welders. They would admit only one color — purple — through the lenses. The goggles had been made under a Manhattan Project priority months before. This was one example of the countless items produced over the past three years for the single bomb.

Jeppson picked up his parachute and buckled it to his harness. Then he hooked his oxygen mask to the emergency oxygen bottle. Several members of the crew eyed him with dismay. Jeppson thought the blast might blow out the windows of the pressurized cabin. If that happened, he was determined not to be caught without oxygen. No one else followed his example. The time was short, and there was much to do.

At 8:11, the *Enola Gay* reached "I.P.," the initial point of the bomb run. The aiming point in Hiroshima was now about 17 miles ahead.

Tom Ferebee leaned forward on his little bombardier's chair and put his left eye fast to the Norden bombsight. Most bombardiers took over control of the plane at the start of the bomb run, but Ferebee and Tibbets had worked out their own system through long practice. Tibbets retained control until the last 90 seconds. Now, Ferebee gave a heading adjustment to Tibbets. "Roger," said the plane commander. At 8:13 plus 30 seconds, Tibbets gave the plane to Ferebee. "It's all yours," he said.

The plane's crew had seen no fighters in the sky. Japan, desperately short of war supplies, wasted no fuel or ammunition for attacks against high-flying observation planes.

Hiroshima lay open and bare beneath the plane. Only a few small clouds hung over the untouched Japanese city. Save for Tibbets, Lewis and Ferebee, who were too busy for vagrant thoughts, the men in the plane had a curious sense of unreality, as though they were floating idly on an aerial sight-seeing excursion.

THE LONG WAIT

Everything seemed familiar to Ferebee, who had seen target photographs—the three great oblongs of land pushing into the bay, the seven fingers of the Ota River, the main roads crisscrossing the city like veins in a leaf.

The aiming point, the center of a main bridge over the Ota's widest branch, moved to the cross hairs of Ferebee's bombsight. Forty-five seconds later, he turned on the bombing radio tone signal that meant: In 15 seconds, the bomb will drop from the plane.

The men of the *Enola Gay* heard the tone in their radio headsets, and each man pulled his goggles over his eyes.

The signal could be heard by radio in the *Straight Flush,* the *Full House* and *Jabbit III,* all flying home to Tinian. It was also heard in the stand-by *Top Secret* on Iwo Jima.

At 8:15 plus 17 seconds, the *Enola Gay*'s bomb-bay doors sprang open automatically. The radio tone stopped as the departing bomb broke a circuit. Little Boy tumbled out broadside, then promptly righted itself, nose to the earth.

The plane lurched up, suddenly 10,000 pounds lighter. The head of every man in her snapped with the jolt.

Little Boy was calculated to explode 43 seconds after leaving the plane. Tibbets spoke fast on the intercom: "Make sure those goggles are on. Caron, keep watching and tell us what you see."

"See anything yet, Bob?" Tibbets asked Caron, after about half a minute.

"No, sir."

Jeppson had started his own count when the tone signal ceased. Now he was nearing the end: "39 . . . 40 . . . 41 . . . 42 . . . 43." Jeppson stopped the count. The thought flashed through his brain: "It's a dud."

At that instant, the world went purple in a flash before Caron's eyes. His eyelids shut involuntarily behind his goggles. "I must be blinded," he thought, remembering in a split second that the sun itself had appeared only faintly when he looked directly at it through the goggles a moment before. He was too stunned to report on the intercom.

Caron had been looking directly at an explosion that, in a slice of time too small to measure, had become a ball of fire 1,800 feet across, with a temperature at its center of 100 million degrees.

DEATH AND DESTRUCTION

A light of frightening intensity flashed through the bombers in an instant and vanished as suddenly as it came.

When the *Enola Gay* completed its turn, Tibbets pulled the nose up again to gain altitude and slow the plane down. Scientists had warned that a shock wave probably would hit the plane about a minute after the bomb exploded. If the plane were climbing at a slower speed, the aerodynamics experts had calculated, the impact would be less.

Caron saw a shimmering line rushing toward the plane. It had the appearance of a heat wave as seen far down an asphalt highway, but it extended in a long curve like a ripple from a rock tossed in a pond. Caron was seeing the first rarefaction wave from an atomic bomb, caused by heavy compression of air followed by a vacuum in which vapor condensed instantaneously, forming a belt of speeding mist. The shock wave rushed at the plane at a speed of 12 miles a minute. Although its probable force had been stressed in briefings, the violence of the wave amazed the men in the three planes.

"Flak!" yelled Tibbets involuntarily. Parsons, who had been through air combat also, had a similar reaction. He felt as though a large antiaircraft shell had burst 20 feet from the plane. But Parsons knew what it was. "No, no," he yelled at Tibbets. "That's not flak. That's it—the shock. We're in the clear now."

Moments later, a second shock wave struck the bombers, this one a reflection of the blast from the ground.

Once the peril had passed, the planes flew south along the outskirts of Hiroshima. Now, for the first time, the bomber crews were able to see what they had wrought.

Dust boiled up from the entire city, and long shafts of swirling gray matter rushed toward the center. A column of white smoke, incredibly tidy in form, stood straight up. At the base, it was flecked with red and orange, and at the top, it formed an almost perfect mushroom. The stem of the strange cloud reminded one man of an enormous grave marker. Within minutes, the cloud mushroom pushed upward almost four miles. Then the mushroom split off from the column and began rising swiftly, finally reaching an altitude of 40,000 feet.

Most of the men in the *Enola Gay* looked down in silence. Lewis uttered just six words:

"My God, what have we done?"

...now, 15 years later,

the faces of Hiroshima

still wear the scars.

For the survivors' story,

see the next four pages.

These Hiroshima survivors bear the brutal birthmarks of the atomic age

To Americans, the bombing of Hiroshima brought swift victory—in a war with Japan that cost 278,000 U. S. casualties—and a gnawing sense of guilt that their country was the first to use this monstrous weapon. To the Japanese, the bomb brought the end of the dream of empire and a vehement hope that such a weapon will never be used again. Today, after nearly 15 years, the bombing is still a living horror in Hiroshima. The city's buildings have been rebuilt; its population is actually larger than before the war. But it remains a city of death, disfigurement and unbearable pain. The residue of sorrow and terror has not been wiped away. Communists and others manipulate the people's resignation and hatred. They seize control of survivor groups, stage demonstrations in the Peace Memorial Park and stir up teen-agers over the genetic effects of radiation. No one can tabulate all of the bomb's consequences. No one can even accurately count the dead. Still living in Japan are 219,000 people who were exposed to atomic attack. The books are not closed.

"IT SEEMS A LONG TIME AGO," says Yoshiko Murato, who was a 14-year-old schoolgirl when the bomb exploded over Hiroshima. "But I still feel the disaster when I meet other victims." That Monday morning, Yoshiko was working with other children, removing lumber to create a firebreak across the city. She heard no sound, saw only a white flash. Many children with Yoshiko were killed. Not knowing she was badly burned, she ran home. When she touched her face, the skin peeled off. Since then, she has had 20 operations and skin grafts.

1960

MAX VON LAUE, 80, PHYSICIST, IS DEAD

German Nobel Prize-Winner in '14 for Work on X-Rays Succumbs to Auto Injuries

Special to The New York Times.

BERLIN, April 23—Dr. Max von Laue, German physicist and Nobel Prize winner, died today in a hospital of injuries sustained in an automobile accident sixteen days ago. He was 80 years old.

Dr. von Laue was driving his car on April 8 when it collided with a motorcycle on a Berlin super highway. He was admitted to a hospital with a severe concussion and other injuries and never regained consciousness.

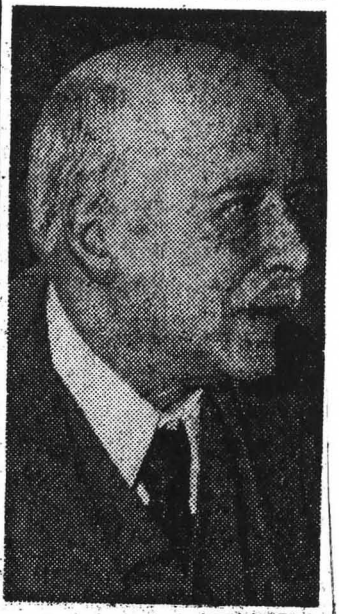
In the early days of World War II he was one of a group of German scientists engaged in atomic work in the Kaiser Wilhelm Institute here. But he resigned in 1943 as an expression of his opposition to the Hitler regime.

After the war, Dr. von Laue was held under Allied supervision in Westphalia for some months. Later he was reinstituted as the head of the Max Planck Institute for Physical Chemistry here.

Planck, Einstein Associate

Dr. von Laue was regarded as one of Germany's greatest physicists. He had been a close associate of the two men whose work formed the basis of twentieth-century physics, Max Planck and Albert Einstein. Planck was the developer of the "quantum theory" and Einstein formulated the theory of relativity.

He received the Nobel Prize in 1914 for his discovery of the diffraction, or breaking up, of X-rays by crystals. Until his experiments science had been uncertain of the nature of X-rays, whether they were particles, waves or pulses. But his success provided strong evidence for the wave theory and opened the way for the exact determination of the wave length of X-rays.



Associated Press

Prof. Max von Laue

Dr. von Laue often expressed awe at the development of physics in the last half-century. The great questions raised by those discoveries, he said, would some day receive astonishing answers.

After the rise of Adolf Hitler, the phyicist won the admiration of his Western colleagues for his stand against nazism.

"Scientific truth must and will make its way against any outward coercion," he told German scientists.

He received an honorary Doctor of Science degree from the University of Chicago in 1948 as a physicist and a "resolute champion of freedom."

Deplored Arms Decision

In 1957, Dr. von Laue was one of eighteen prominent German physicists who publicly deplored the decision to equip the West German armed forces with tactical nuclear weapons. They refused to take part in the production, testing or use of the weapons. The stand caused added controversy because he and several of the protesters were members of the Max Planck Institute, one of the principal nuclear research centers in West Germany.

The physicist, whose full name was Max Theodor Felix von Laue, was born in Prussia on Oct. 9, 1879. He attended the Universities of Strasbourg, Goettingen and Munich, then studied under Planck at Berlin, where he received his doctorate in 1903. He was a professor of physics at Goettingen and a former director of the Kaiser Wilhelm Institute in Berlin.

In 1955 he was one of fourteen persons appointed to the Pontifical Academy of Science by the late Pope Pius XII. He also was a member of the Royal Society of England and the American Physical Society.

Dr. von Laue received the Max Planck Award from the German Physical Society in 1932 and held the Pour le Merite, which had been Germany's highest civilian decoration until it was banned by the Nazi regime.

8/11/60

DR. VEBLEN DIES; MATHEMATICIAN

Retired Princeton Professor Wrote Leading Geometry Works—Wilson Protege

Special to The New York Times.

PRINCETON, N. J., Aug. 10—Dr. Oswald Veblen, internationally known mathematician who was associated with Princeton University for many years, died early this morning while vacationing in Brooklin, Me. He was 80 years old.

He is survived by his widow, the former Elizabeth Mary Dixon Richardson, and two sisters.

Protégé of Wilson

Dr. Veblen was one of the fifty promising young scholars that Woodrow Wilson, president of Princeton University from 1902 to 1908, obtained to instill new vigor into the university.

When Dr. Veblen received an honorary degree of Doctor of Science at Princeton in 1957, he was referred to in his citation as "this giant of geometrics out of the West" who was called to "help establish Princeton as one of the great mathematical centers of the world."

Dr. Veblen is credited with several noteworthy contributions in geometry. These includes studies in what is known as analysis situs. The problem posed in analysis situs, in somewhat simplified terms, is: When several types of knots are tied in a single piece of string, how can the differences among these knots be expressed mathematically? In 1922 Dr. Veblen's "Cambridge Colloquium Lectures on Analysis Situs" was published.

He was born in Decorah, Iowa, on Jan. 24, 1880, a son of Andrew A. and Kristi Hougen Veblen and a nephew of Thorstein Veblen, the noted economist. After obtaining an A.B. degree from the University of Iowa in 1898, Dr. Veblen received the same degree at Harvard two years later and the degree of Doctor of Philosophy at the University of Chicago in 1903.

1941

Dr. Oswald Veblen

Dr. Veblen was an associate in mathematics at Chicago from 1903 until 1905, when he went to Princeton. In 1910 he became Fine Professor of Mathematics at Princeton.

He held this post until his retirement from the university in 1932. He then became the first Professor of Mathematics at the Institute for Advanced Study in Princeton and, in 1950, a professor emeritus.

Headed Mathematical Society

A member of many learned societies in the United States and Europe, Dr. Veblen was president of the American Mathematical Society in 1923-24. During World War I he was a major in the Army Ordnance Department and served with the office of the Chief of Ordnance in an advisory capacity in 1923-24.

In July, 1957, it was announced that Dr. and Mrs. Veblen had given eighty-one acres of their property near Princeton for the development of a public arboretum. Mrs. Veblen expressed the hope that in one rural Princeton the tract would offer a place "where you can get away from cars and just walk and sit." The tract was valued at about $154,000.

Dr. Veblen's books include "Infinitestimal Analysis' (with N. J. Lennes) (1907); "Projective Geometry," Volume I with J. W. Young) (1910); "Projective Geometry." Volume II (1918); "Invariants of Quadratic Differential Forms," (1927); "Foundations of Differential Geometry (with J.H.C. Whitehead) (1932); "Projektive Relativitaetstheorie," (1933) and "Geometry of Complex Domains" (with Wallace Givens) (1936).

The Men Around 'Fat Man'

By JOHN W. FINNEY

SHORTLY before dawn of July 16, 1945, Samuel K. Allison, a middle-aged nuclear scientist, sat nervously in "South 10,000," a concrete command post dug into the desert sands of Alamogordo Air Force Base in New Mexico. His assignment: the countdown of the end of an era and the beginning of the nuclear age.

Five miles to the north, suspended in a 100-foot-high steel tower, was a device known as "Fat Man." Across the Atlantic, President Truman, attending the Potsdam Conference, was touring the ruins of a Berlin shattered by conventional explosives. Across the Pacific, troops were staging for the final assault on Japan. They knew nothing about "Fat Man," which was about to change, and perhaps save, their lives.

For more than two years, in unprecedented secrecy, a team of scientists on top of a New Mexico mesa known as Los Alamos had been working to develop and build "Fat Man," an atomic bomb made of a precious, fissionable material called plutonium. Now "Fat Man" was about to be tested.

"Zero minus twenty minutes," Allison said into a microphone at ten minutes past 5 in the morning, Mountain Time. Outside the dugout stood J. Robert Oppenheimer, who had directed the Los Alamos laboratory. In the predawn darkness, he glanced up anxiously at a stormy sky to see whether two stars he had been watching through the night seemed any brighter. Thunderstorms already had forced one postponement of the test.

As the countdown changed from minutes to seconds, the tension "increased by leaps and bounds," it was recalled later by Brig. Gen. Thomas F. Farrell. A World War I military hero, Farrell was deputy to Brig. Gen. Leslie R. Groves, who, as head of the so-called Manhattan Project, was in over-all charge of developing the bomb.

"Everyone in that room knew the awful potentialities of the thing that they thought was about to happen," General Farrell was to write in a report to the War Department. "The scientists felt their figuring must be right and that the bomb had to go off, but there was in everyone's mind a strong measure of doubt. * * *"

As the last few seconds were reached, Oppenheimer became visibly tenser. He scarcely breathed and held on to a post to steady himself.

Inside the command post,

(Continued on Following Page)

11/27/57

THE NEW YORK TIMES, SU

N.Y.U. PROFESSORS WILL GET JOB AID

Placement Service Is to Be Extended to the Retiring Members of Faculty

New York University has established a placement program for retired faculty members.

The University's Office of Placement Services will conduct the program, in addition to finding employment for students and graduates of N. Y. U. The office will counsel retiring faculty members and provide information on jobs and research opportunities.

The retirement age at N. Y. U. for faculty and staff is 65. However, professors reaching 63 may go on a half-time schedule for four years until they reach 67 or continue full time and retire at 65.

Dr. Alonzo F. Myers is director of N. Y. U.'s Retirement Counseling Center and Walter L. Kelly is director of the placement service. They reported on a survey of 107 professors who had retired from the university in the last ten years. The study was made by Dr. Margaret G. Benz, associate professor of sociology at the Washington Square College of Arts and Science.

After the 107 retired, 52 per cent obtained employment: 63 per cent in full-time jobs. Twenty-eight per cent accepted teaching positions.

"The evidence presented by Dr. Benz' survey," Dr. Myers said, "indicates a continued interest by retired professors in gainful employment."

The purpose of the new program, he explained, is to help retired faculty members to find places where their talents can best be used and to help meet the needs of individuals.

Among the questions asked of each retired professor was: "At the time you retired, would you have been interested in moving to a different community as a professor; if necessary, at a reduced salary?"

Russians Issue Stamp Showing First Satellite

Design of Soviet stamp

Stamp dealers here have received from the Soviet Union a new 40-kopecks blue stamp showing the first Russian satellite circling the earth.

In the upper lefthand corner is printed Oct. 4, 1957, the date the sputnik was launched. The lower right corner says that the Soviet earth satellite is the first in the world. The satellite is shown over Russia after having circled the globe from southwest to northeast.

Used for standard mail in Russia, the stamp is the equivalent of 4 cents in United States money. It is on sale in this country for about 50 cents.

Educating the Educators

Wide Study Likely of Administrators' Call for Reforms in Teachers' Training

7/13/60

By FRED M. HECHINGER

The American Association of School Administrators has courageously violated the oath of all alumni: my college right or wrong.

In its thirty-eighth yearbook, 1960, "Professional Administrators for America's Schools," the association calls for a housecleaning of the universities and schools of education that have trained many of them and will be turning out the public-school leaders of the future.

News Analysis

The spiderwebs the administrators want to sweep away include courses that are removed from reality and teaching methods that "provided excellent demonstrations of what students had been advised not to do in their previous education courses."

They urged, instead, a rigid selection system that would let only the fit survive; a practical study of the life, economics and "power structure" of real communities so that future school leaders could learn the political as well as the academic facts of life; rigorous studies in economics, sociology, speech, business management and the like, and a period of internship.

Professional Basis Urged

In this critical appraisal, the administrators made it clear that they did not want any courses in How to Count Lunchroom Money. They called for "professional standards" backed by superior knowledge. They said bluntly that many state departments of education were "woefully handicapped by the pressure of political forces" and therefore "are often impotent in enforcing standards" on weak institutions.

This amounted to a demand that "the profession" itself impose such standards—presumably in the manner in which the medical profession demands certain standards of accredited medical schools.

To show that it means to extend its spring cleaning to its own house, the report also calls for a code of ethics that would disqualify offending school administrators "from further practice of the profession."

There may be anguished protests from defenders of autonomous local school boards since the report throws serious doubt on the ability of these lay bodies to tell whether a candidate for the local job is a good superintendent or principal, or a bad one.

Not only the universities but also their product as well need to be measured with "a quality yardstick," it was asserted. The association, pointing naturally to its own power, wants such a yardstick, comparable to the "passing the boards" in other professions.

Serious Argument Likely

There will be serious argument over some proposals, especially the danger of a raising of the barriers between the teaching and the administration aspects of the profession. But this unexpectedly tough, critical appraisal of school leadership will receive wide attention.

However, there is one further area in need of reform that is only implied in passing. That is the undergraduate education that lays the foundation for the specialized, professional training. The report reproduces the college transcripts of two candidates for a superintendency in a case study of an appointment.

One candidate, a graduate from "a well-known New England liberal arts college," came with a pretty sound preparation. It might be questioned, however, whether his one term of college physics qualified him to teach the subject, as he did later on. His graduate courses were a strong merger of further academic and pedagogical work.

The second candidate obtained the degree of Bachelor of Science in Education from a small state university. Although he had taught social studies, along with football and skiing, his entire "social-studies" background consisted of one course each in History of Civilizations, Political Science, Principles of Sociology and Problems of the Family.

He had had a smattering of English courses, a course in French Literature, two years of French grammar and one year of French composition, followed in strange succession by French syntax. Unaccountably, Beginning German cropped up in the third year, not to be followed by any further work in that language. Also represented were one course each in geology, structural geology and meteorology.

Education Studies Abound

On the other hand, the candidate had taken a steady stream of theoretical education courses. These had included Psychological Principles of Education, Social Principles of Secondary Education, Principles and Problems of Teaching, History of Education, Teaching of Foreign Languages, Democracy in Education and Philosphy of Education.

The school board in the case study chose neither of the two candidates. It hired a third candidate whose college transcript it did not have at its disposal and who had been graduated from a state teachers college.

But the issue is not the case study or even the board's haphazard selection procedure, which the administrators' report exposes.

The question is whether a close scrutiny of the graduate, professional training, should not be supplemented by a critical look at the standards and content of the undergraduate years. The association's commission points out thta its reform proposals for the graduate programs will require a great deal of effort and money. Therefore, it may be wise to imply that the undergraduate colleges still have a little time for self-policig left before they, too, will have to be pulled over the curb by professional gendarmes wielding quality yardsticks.

SATURDAY, NOVEMBER 23, 1957.

SCIENTIST DOUBTS FREEDOM IS VITAL

Others at Symposium Here Disagree on Implications of Soviet Achievements

By ROBERT K. PLUMB

Perhaps science can flourish and obtain particular goals without the "freedom" that scientists have long asked for, Chancellor Clifford C. Furnas of the University of Buffalo suggested here yesterday.

Other scientists at a symposium on "The Next Hundred Years," arranged to celebrate the centennial of Joseph E. Seagram & Sons, Inc., agreed in part with this appraisal. The meeting was at the Waldorf-Astoria Hotel.

"I have a confession to make," Chancellor Furnas, a chemist, said. "For a long time I have felt that freedom and initiative played a part in science. I have heard that true science could only grow in comparative freedom. The demonstration of what has been accomplished by Soviet science, in terms of objectives attained over a thirty-year period have disproved this.

"I do not think that the results obtained by the Soviets are the type of scientific achievement that is going to benefit humanity in the long run—over 100 years. For this, freedom is best. But in particular areas, science can grow and flourish in an atmosphere not free."

Dr. Harrison Brown, Professor of Geochemistry at the California Institute of Technology, suggested that Russian scientists might be ahead of American scientists in beating red tape.

This view, Dr. Brown said, came after talking to Russian scientists at six international meetings in the past three years. In fact, Dr. Brown reported, "the Russians are doing extraordinary work in a variety of fields, although I do not know if their science cares much for the 'how' and 'why' of things.

Russians and Red Tape

"A Russian friend of mine told me not long ago that 'you Americans are really behind the eight-ball'," Dr. Brown reported. "We Russian scientists have had quite a few years' experience operating with red tape—you Americans are just beginning."

Dr. Wernher von Braun, who worked on rockets in Nazi Germany (he is now director of the Development Operations Division of the Army Ballistic Missile Agency at Huntsville, Ala.) said that it was "myth" that scientists under dictatorship must work under terrible tyranny.

In his work in Germany, Dr. von Braun said, he traveled wherever he wanted to—even to other countries—and he never had to fill out any papers or tell anyone where he was going. Tyranny of dictatorship did place a "gun down the neck of the scientist," Dr. von Braun said, because "you always had the feeling that a brick might fall on your head." This, he said, German scientists had learned to live with.

Dr. Herman J. Muller, a Nobel prize laureate now at Indiana University, said that he worked at the Institute of Genetics in Moscow from 1933 to 1937.

Biological Blunders Seen

"I felt I did have a gun pointed down my neck," he said. Soviet leaders happened to make correct decisions in the physical sciences, he said, but they made "terrible blunders" in biological lines. If Russian biologists had been allowed "freedom," they would be where we are now, he said.

During the symposium, eight scientists discussed what might happen in the next century. All prefaced their predictions with an "if," a condition that man himself survive the century without causing catastrophe.

Dr. Furnas said he expected that the seas would become our sources of minerals, nuclear energy would be our power source and sunlight would be harnessed for chemical synthesis.

Dr. Brown predicted that machines would eliminate the need for unskilled and semi-skilled labor.

Dr. von Braun predicted that resort hotels with picture windows to take advantage of the magnificent view would be operating on the moon.

Dr. Muller predicted that frozen germ plasm from people "of demonstrated ability" would be mixed under the microscope to produce superior human beings.

Longer Life Foreseen

Dr. Albert Szent-Gyorgyi a Nobel laureate and director of the Institute for Muscle Research at Woods Hole, Mass. predicted that man's lifespan would be extended by years of full vigor and activity.

Dr. John Weir, psychologist at the California Institute of Technology, predicted that man would be able to alter his size, shape, and function. Intelligence can be improved, he added.

Dr. James Bonner, Professor of Biology at California Institute of Technology, predicted that, among other things, man would develop a synthetic steak with plastic built-in chewiness.

Dr. Detlev W. Bronk, president of the National Academy of Sciences, was chairman of the symposium. William L. Lawrence, science editor of The New York Times, was moderator. Scientists were questioned by three television news commentators, Edward R. Murrow, John Daly and Chet Huntley. Samuel Bronfman, president of Seagram, planned the session. In addition to manufacturing whisky, the comapny produces chemicals and pharmaceuticals.

11/23/57

MURRAY ASKS REVIEW IN OPPENHEIMER CASE

Thomas E. Murray, a former member of the Atomic Energy Commission, said yesterday that the Administration should consider inviting Dr. J. Robert Oppenheimer to return to Government service, this time as a member of the President's Science Advisory Committee.

But first it would be necessary to restore Dr. Oppenheimer's security clearance, Mr. Murray said. He urged a review of the 1954 decision by the Atomic Energy Commission that barred Dr. Oppenheimer from access to atomic secrets. Dr. Oppenheimer, who helped develop the atomic bomb, is now director of the Institute for Adanced Study, Princeton, N. J.

Mr. Murray, who was one of the commissioners who voted against Dr. Oppenheimer in a 4 to 1 decision in 1954, stressed that he had not changed his own judgment. The New York Times yesterday incorrectly implied in a headline that he had reversed his opinion.

Mr. Murray explained:

"I'm not in a position to make any new judgment because the necessary information is not available to me. I merely said that the case should be reviewed.

Rhodesian Parties to Merge

NDOLA, Northern Rhodesia, Nov. 22 (Reuters)—The Federal party, governing party in the Rhodesian Federation, has voted to merge with the United Rhodesia party, which forms the southern Rhodesian Government, the Federal party congress here decided today. The United Rhodesia party has already agreed to the merger.

BIOLOGIST WARNS ON 'IVORY TOWER'

Leader Sees Gains Putting on Science Responsibility That Is 'Frightening'

By LAWRENCE E. DAVIES
Special to The New York Times.

PALO ALTO, Calif., Aug 26 —The nation's biologists as a group got a dressing down tonight from one of their leaders.

Dr. H. Bentley Glass of Johns Hopkins University warned that they were far from ready to assume "the frightening responsibility" that accompanies prospective discoveries capable of altering human life.

These discoveries, he said, arecom parable in their "revolutionary and potentially devastating" aspects to the atomic bomb. Mankind, he asserted is not prepared to use and control nuclear power and it will "require all our wisdom to control" the biological discoveries on the verge of which science stands.

If man were "sufficiently foolhardy," he declared, he might now be involved with "the last chapter of human history, the terminus of the timescale."

As past president of the American Institute of Biological Sciences, Dr. Glass gave thepri ncipal address at opening of the institute's annual meeting, being held at Sanford University.

Points to 'Ivory Tower'

He called upon biologists to "observe soberly the conscience-stricken efforts of some atomic scientists."

"For," he went on, "what we will do with our biological discoveries to alter human life we are divenely ignorant. This is our ivory tower. And yet, a little comprehension of human history and the inescapable nature of human society, of human motives and human values, might save us in time."

He chided fellow biologists on these counts:

"Of men, we know most fully the nature of sex and its significance among living organisms — and despite this seem to experience as much divorce and marital unhappiness as any other group.

"Of all persons, we know must fully how to banish famine and malnutrition — yet each effort of agricultural biology results in a soaring growth of population that threatens to recreate conditions of hunger of, at the least, gravely to lower the general standard of living.

"Of all persons, we know most fully how to exercise the demon of disease — yet every handicap corrected by medical biology multiplies in the population the hereditary factors that are in part on entirely to blame."

Reproach Driven Home

He added:

"I would feel no confidence in asking the profession of biology to take over the regulation of our Government and our society. There are so few biologists who have gained anything like the required experience by entering into such public affairs as face citizens every [illegible]. There are so few biologists who endeavor to make their biology count for anything outside the laboratory and the classroom."

This, Dr. Glass said, was partly the result of training that made "the scientist into a narrow technician and the student of the humanities or social studies into a scientific ignoramus."

How dare scientists, he demanded, complain "at the inadequacies and inaccuracies of scientific reporting in newspapers and magazines unless we endeavor to better the situation ourselves?

"How many scientists will trouble themselves to try to write good exposition for the layman?" he asked.

"The result of our attitude," he went on, "is that science is portrayed to the American people, if not abroad, by dilettantes, by charlatans and by reporters who, deliberately or unconsciously, falsify the values and aims of biological science."

Gain in War on Viruses

At the meeting of scientists from the Army Chemical Corps Biological Warfare Laboratories at Fort Detrick in Maryland reported a possible weapon against human virus diseases such as poliomyelitis, yellow fever and influenza.

Lieut. Thomas C. Allen Jr. and Dr. Robert P. Kahn said that extracts from rice inhibited the growth of some plant viruses and might have human application.

Dr. Michael A. Bender of Johns Hopkins University reported that experiments there in which cells wer esubjected to moderate doses of X-rays indicated that the National Academy of Sciences set too high a figure as the average "maximum permissible dose" or radiation for the population.

He warned that a sharp revision in estimates of "safe" doses of radiation would have to be made "if the rates of this and other types of radiation-induced damage to human tissues are found to be correspondingly high in further experiments."

Hhe Johns Hopkins tests were described as th efirst in which normal human cells were subjected to known doses of radiation and the resulting damage was measured carefully.

Russian Warns on Tests

A scientist from the Soviet Union urged here yesterday the end of nuclear tests, saying that they made fish radioactive and that the fish, as food, endangered the lives of humans.

Lev A. Zenkevich of Moscow University is an expert on marine life. He arrived by air to attend a meeting of deep sea authorities at the Oceanographic Institutes, Woods Hole, Mass.

Arrivng with him were Dr. [illegible]

TEMBER 4, 1957.

PRINCETON APPOINTS 17 GUEST PROFESSORS

Special to The New York Times.

PRINCETON, N. J., Sept. 3 —Martin Buber, 79-year-old Professor Emeritus at Hebrew University and an authority on Jewish theology and philosophy, is among seventeen men who will join the Princeton University faculty as visiting lecturers and professors for the coming year.

Many of the visitors are guests of the Humanities Council of Princeton or are supported by special endowments and grants.

Dr. Charles de Tolnay comes to the Art and Archaeology Department as an authority on the northern Renaissance. Dr. Freeman Twaddell, Professor of Linguistics at Brown University, will join the Classics Department as a Senior Fellow of the Council of the Humanities.

The others are:

Earl A. Coddington of the University of California at Los Angeles, mathematics.

Thomas G. Room of the University of Sydney, mathematics.

John P. Roth of the International Business Machines Research Center in Poughkeepsie, N. Y., and staff mathematician for the Institute for Advanced Study, mathematics.

Morton Deitz of the Princeton law firm of Smith, Stratton & Wise, economics.

Francisco Ayala of the University of Puerto Rico and author of sixteen books on Spanish literature, modern languages.

William W. Austin of Cornell University, music.

Dr. Aziz S. Atiya, chairman of the Department of Medieval History at Alexandria University in Egypt, Oriental studies.

Dr. Nelson Goodman of Pennsylvania University, philosophy.

Richard M. Hare of Balliol College, Oxford, philosophy.

Dr. Hans Jonas of the New School for Social Research, philosophy.

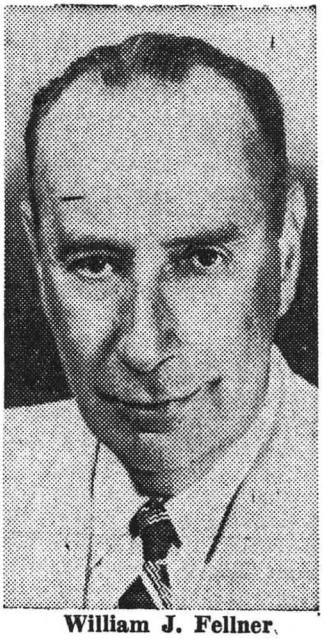
Dr. Jose Ferrater Mora of Bryn Mawr, philosophy.

Dr. John C. C. Smart of Adelaide University, philosophy.

Paul Ziff of Harvard, philosophy.

Dr. Rudolf Haag of the University of Munich, physics.

Yale Establishes Chair In Economic Research



William J. Fellner

Special to The New York Times.

NEW HAVEN, Sept. 24—Yale University announced today the establishment of the Irving Fisher Research Professorship in Economics. The new chair, set up with a grant of $500,000 from the Ford Foundation, is named for the late Professor Fisher, a member of the Yale faculty from 1890 until his retirement in 1935. He died in 1947.

The first educator to hold the new chair is William J. Fellner, Professor of Economics at Yale since 1952. Under the terms of the endowment, the Fisher Professorship cannot be held by any appointee for more than two years.

A student of the theory of business cycles and employment and of monetary and price theories, Dr. Fellner is is residence at Cambridge University for the current academic year. The endowment directs that the scholar named to the chair be relieved from routine classroom work and devote full time to research.

SCIENTISTS FEAR CUT IN RESEARCH

Continued From Page 1

D. Foote, Assistant Secretary for Defense for Research and Engineering, and in turn relayed to Charles E. Wilson, Secretary of Defense.

The board's concern was indicated by the fact that the basic research programs had not been on the official agenda. The board members brought up the subject on the basis of reports within the scientific community that basic research spending was about to be curtailed by the Defense Department.

No Firm Decision Reached

Defense research officials said that no firm decisions had yet been made to reduce basic research spending. But they did not preclude the possibility that such cuts would be made as the Defense Department sought to bring defense spending down to $38,000,000,000 for the current fiscal year.

As part of the economy campaign, the Defense Department has ordered reductions in spending on over-all research and development, as in all other military programs.

The Army is expecting to cut about $100,000,000 from the $410,000,000 it planned to spend on research and development this year; the Navy about $50,000,000 in its planned $500,000,000 research budget, and the Air Force at least $100,000,000 from $800,000,00 originally estimated.

These reductions apply to all forms of research and development—from design of a better landing gear for a supersonic airplane to a study of what happens to molecules in nitrogen gas when it is heated.

Basic research involves the exploration of scientific unknowns with the aim of broadening scientific knowledge rather than development of specific items for warfare or civilian use.

Difficulty Under Wilson

During the tenure of Mr. Wilson as Defense Secretary, basic research has had a difficult fiscal time, largely because of its seemingly nebulous connection with actual military developments. While still new in office, Mr. Wilson explained his attitude toward basic research. He said he was not interested in what made the grass green or fried potatoes brown.

To scientists, however, basic research represents the spring filling the reservoir of scientific knowledge from which come the weapons of tomorrow. In the present revolutionary state of weapons developments, scientists are constantly depleting the reservoir and pressing on the limits of scientific knowledge.

At Wednesday's meeting several scientists were reported to have argued that with the cutback in military forces, basic research should be expanded to assure the United States technological superiority in the years ahead.

The impending cutbacks seem likely to fall heaviest on the basic research program of the Air Force. The Army and Navy perform much of their basic research in their own laboratories and therefore are in a better position to absorb spending limitations. The Air Force, however, does almost all of its basic research through contracts with universities and research firms and has little leeway in paying the bills as they come due.

When the research cutbacks were first ordered in the last two weeks, the Office of Scientific Research, the Air Force's basic research agency, felt it had received its death warrant. The original orders were to cut the office's $16,000,000 budget by 50 per cent, leaving it with only about enough money to pay for past bills.

Air Unit May Get Reprieve

There are indications now, however, that the agency will be granted a reprieve to carry on its absic research program, although probably on a more limited scale.

Richard E. Horner, Assistant Secretary of the Air Force for Research and Development, said the Air Force realized it had made "a mistake" in imposing the severe spending ceiling on the Office of Scientific Research. Arrangements are being made, he said, to review the entire basic research program and to continue the priority projects.

The Air Force, however, is concerned that even if the fiscal orders are reversed, much damage will have been done to the close working relationship built up between the Office of Scientific Research and private scientists. Already one large midwestern university has decided to terminate basic research for the Air Force because of the fiscal uncertainties, and other universities have indicated they may follow suit.

In the last four years, spending on military research and development has been maintained at a plateau of about $1,500,000,000 annually. With rising research costs, rapid Soviet Union technological advances and the dynamic state of weapons developments, military research officials feel this level has actually represented a descending curve of spending on research.

Democrats Score Cuts

WASHINGTON, Sept 21 (AP)—Senator Mike Mansfield, Democrat of Montana, said today that the Eisenhower Administration might be "placing economy ahead of our security" in reducing the strength of the armed forces.

Senator Henry M. Jackson Democrat of Washington, said at the same time the Pentagon's orders to reduce military manpower by 200,000 would reduce our armed forces below levels approved by Congress."

Defense Scientists Fear Research Cut

By JOHN W. FINNEY
Special to The New York Times.

WASHINGTON, Sept. 21 — The Defense Department economy wave is threatening to undercut the scientific research that will provide new weapons decades from now.

The possible economy cuts in the military's basic research programs have caused concern among members of the Defense Science Board. The board is composed of twenty-eight scientists and engineers from the military services, government agencies, private industry and universities. It acts as an advisory group to the Defense Department.

At a secret meeting Wednesday, it was learned, the board drafted a statement cautioning against any economy cutbacks in basic research. The statement was submitted to Dr. Paul

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INSTITUTE FELLOWS NAMED

From 15 Countries. Fuld Hall and the other facilities of the In-

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Topics Of The Town

—Continued from Page 14

stitute for Advanced Study will be buzzing with intense activity this fall. With the completion of the strikingly modernistic housing project, the apartments will be occupied by outstanding scholars from 15 countries who have been named members of the Institute for the coming academic year.

The Institute announced this week that 127 scholars, internationally-acclaimed in their respective fields, have received appointments as member of the privately-endowed research foundation which enables scientists, mathematicians as well as leaders in the social sciences and the liberal arts to work on independent projects.

Before a man (or woman) can be chosen for membership, he must have already made a reputation in his special field of interest. The primary divisions of the Institute are the Schools of Historical Studies and Mathematics.

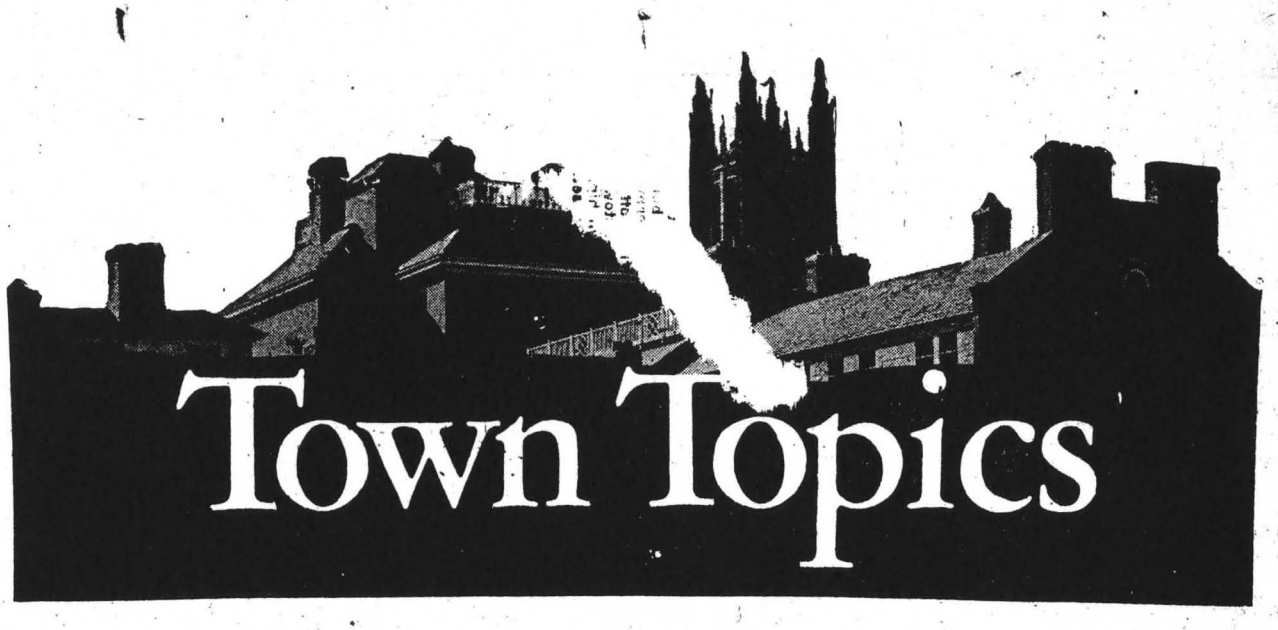
The countries represented among the members of the Institute will include England, Germany, France, Israel, India, Sweden, Japan and Argentina. The scholars are all associated with topflight universities or research organizations in their respective countries.

Niebuhr to Study Here. This year's list of members include Dr. Reinhold Niebuhr, one of the world's leading Protestant theologians. He is professor at the Union Theological Seminary in New York City.

Dr. Niebuhr will center his research in political philosophy in the School of Historical Studies during the second term of this year. Also named to the school was Jean Gottmann of the Institut d'Etudes Politiques in Paris. He is concerned with studying what he terms "Megalopolis," the continuous urban area stretching down from Boston to Washington.

Derek J. Price of Christ's College, Cambridge, well-known for his work in the history of science, and C. Veronica Wedgwood of London, author if a number of historical works, are among the English scholars who will study here.

In the School of Mathematics, 102 members were appointed as compared with 23 in the School of Historical Studies. The mathematicians include Jean-Paul Serre of the College de France who in 1954 shared the Fields Medal with Kunihiko Kodaira, another member of the Institute and University, who was recently honored by Japan. The medal is the equivalent of the Nobel Prize in mathematics.



Town Topics

WE NOMINATE

Harold Marston Morse, one of the great American-born mathematicians of his time and now the senior active member of the Mathematics Faculty of the Institute for Advanced Study, who has been the driving force in organizing the continuing two-week mathematical conference at the Institute. While the subject-matter of the seminars and addresses (which have attracted representatives of 13 nations to Princeton for a period of two weeks) means little to the layman, the fact that they are being held here accentuates Princeton's position as the "Mathematics Capital" of the Western World and points up the importance of studying both the classical and ultra modern aspects of mathematical theory—particularly at a time when free man is desperately seeking new knowledge.

One of the ten American members of the centuries-old French Academy of Science, the 65-year old Morse (whose younger son captained Princeton Country Day's tennis team last spring) has been a confirmed Princetonian since he was appointed to the Institute Faculty in 1935. In the preceding 15 years at Cornell, Brown and Harvard he had gained international recognition as a theoretical mathematician, particularly for his contributions to "analysis in the large" and for his refusal to recognize the existence of barriers between the various branches of mathematics such as algebra, geometry and calculus. He—so reliable authority reports—probes them all in order to give greater unity and depth to his researches.

Marston, a native of Waterville, Maine, and a tennis-playing *summa cum laude* graduate of Colby College in 1914, took his graduate work in mathematics at Harvard and days after receiving his Harvard doctorate volunteered for a two-year tour of duty that was to be culminated by the award of one of France's most coveted combat decorations. A quarter-century, and another war, later, Morse was honored by the United States for his services as a high-level consultant, for helping make possible the optimum use of the proximity fuse and for directing the mobilization of this country's mathematicians for the war effort. In between conflicts he had published widely and was as well known in European universities as he was in the United States.

Unlike the majority of his co-workers on the "planes" of mathematics, Morse has been endowed with a wonderful capacity for stirring the imagination of scholars and laymen alike. Several years ago, in speaking at Kenyon College, Ohio, he stated that "the basic affinity between mathematics and the arts is psychological and spiritual." Artists and mathematicians, he believes, share their "instinct of self-preservation as creators of art" and their overwhelming desire "to understand and to create." These statements prompted a seeing *New York Times* critic to comment: Morse's talk "was the bombshell of the conference, the contribution . . . which struck sparks from the most sluggish minds in attendance."

For helping promote, organize and administer one of the most searching mathematical conferences of the Atomic Age; for looking upon mathematics as something vitally relevant to the growth of freedom; for his rare understanding of the unity of knowledge and the diversity of human beings; he is TOWN TOPICS' nominee for

PRINCETON'S MAN OF THE WEEK

Harper's MAGAZINE

AMERICAN COLLEGES

what their catalogues never tell you

DAVID BOROFF

Most young people now heading for college are going to be sadly disappointed—for reasons both teachers and administrators ought to be ashamed of . . . and the public doesn't need to tolerate.

A FRIEND of mine, a college dean and a mild insomniac, recalled that when studying for his Ph.D. in education at Harvard, he used a prominent journal of education as a soporific. Ten minutes of curriculum planning, and he was sound asleep. "It never failed," he said appreciatively.

That is one of the things wrong with education today—the stupefying boredom its high-toned idiom generates. There is hardly an educational journal written with grace and sophistication. But that is merely a symptom of higher education's ills. First, a grim statistic: the student drop-out rate is almost 60 per cent. For more than half its clients, the service that colleges render is unsatisfactory—or the customers ill-chosen. Second, we find failure when we look at the product—the college graduates. How many of them are shaped significantly by their experience? How many have developed the habit of disciplined thinking? How many, by decent standards, are well educated? Very few, the honest college teachers would acknowledge ruefully. It is just possible that professors and students are actors in a vast comedy, a mad travesty of solemn ritual, wasted time, and trumped-up claims.

During the past two years, I visited a dozen or more campuses, talked with presidents, deans, professors, and hundreds of students. I described six of these institutions in two series of articles in this magazine and am preparing this material for publication in book form. I have also taught in college—both full-time and part-time—for a dozen years. What I offer here is the distillation of my observations. If they seem harsh, it is not that I lack tenderness for higher education. Americans have perhaps too much, born of the stubborn conviction that somehow education is a good thing. (Education is our secular church—the one faith that unites us all.) If I seem at moments assaultively critical, it is out of *my* conviction that education is too valuable to fool around with; we shouldn't permit it to settle into a bog of sloppy sentimentality and vested interests.

This is no dirge about the fall of valor. No doubt, colleges are better than they were a few decades ago. Students work harder; there is less nonsense. But the old mummeries no longer

deceive. It is self-evident that higher education is not good enough.

We have imposed upon our colleges, as we have upon the lower schools, an almost hopeless array of tasks. Our educational goals are at once aristocratic and democratic, vocational and intellectual. We want our college students to be intellectual stalwarts, impassioned seekers after truth, but we insist also that they be regular guys and nice girls, skilled in ballroom dancing and badminton. We pull our curricula this way and that depending upon which ideology is in the ascendancy. And the students, caught in these crosscurrents, are somewhat bemused.

They are nice enough kids—decent, good-natured, a little torpid perhaps. Their vision is pinched off by career and marriage and what passes for the good life on TV commercials. They want a degree—a visa for Suburbia. What can we do with their four years of college to make of them more than trivial rites of passage?

HOW TO TELL THEM APART

IN making the rounds, I was struck by the fact that schools divide into two kinds: those which we might call adolescent reservations, fenced off from serious adult concerns, and those which represent a transition to adulthood. Harvard is an example of the latter. If anything, there is at Harvard an expropriation of an unattained adulthood which can be disconcerting. The adult visitor is not only treated like a fellow citizen of the republic of learning but sometimes like an apprentice. Nevertheless, I far preferred the condescension of Harvard striplings to the opacity I found elsewhere.

When I visited Harvard I brought the inverted snobbery that only someone with a working-class background and a municipal college education could have. I came to scoff but remained to be impressed. No academic person could resist the exuberant play of ideas. It is a great university. Wisconsin offers a vivid epitome of American democracy—its strengths and weaknesses. Birmingham-Southern College provides a familial warmth that is pre-eminently Southern. Sarah Lawrence reflects a measure of intellectual daring that is still rare. Brooklyn College yields a solid education for a subway token. Claremont has a multi-college plan that may be tomorrow's answer.

One can hardly resist the fantasy of shuffling the elements of some of the schools. Birmingham-Southern could learn from some of Brooklyn College's intellectually bellicose kids, just as Brooklyn could profit from BSC's relaxed rhythms. Wisconsin's hurly-burly of farmer's son and storekeeper's daughter might dilute Harvard's tendency toward preciousness. There should be an infusion of Claremont's rugged optimism about higher education in boards of trustees all around the country.

What about size? There is no ideal size, but those huge city-states like Harvard or Berkeley or Chicago are naturally the ones we hear about most. It is important to remember that a university's reputation is usually based on its graduate schools, not on the quality of undergraduate instruction. Few people know this—except disgruntled undergraduates—for the great universities keep their reputations golden through research breakthroughs, Big Names, and books, books, books. What takes place in freshman composition or World Civilization I is of less moment.

The truth is that a small school is often better equipped to deal with the tenuous beginnings of intellectual life. A senior I met at the University of Wisconsin had transferred from a cornball college in Iowa. At the smaller school, she said, she wrote far more papers and had easier access to faculty. In fact, she assisted a political science professor as he journeyed about the district electioneering for a Democratic candidate. "I helped elect the first Democratic Congressman in that district," she said proudly. At Wisconsin she became social chairman of the Student Union, but surely she must have had a wan sense of decline from the heroic days of routing out rural Democrats.

On the other hand, Dr. Conant's strictures against small rural high schools apply to colleges. There are small colleges tucked away in rural areas that are no more demanding than a good city or suburban high school. Our new educational egalitarianism—every citizen a B.A.—keeps them going.

"If you have a high-school diploma and have stayed out of jail, then you can go to college," a critic observed tartly. The danger of this new stampede, according to Charles Frankel, is that

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David Boroff wound up his series of articles on individual American colleges coast to coast in the December "Harper's" with "California's Five-college Experiment." Educated at Brooklyn College, Yale, and Columbia, he served as a Japanese translator for Military Intelligence during the war and has been teaching English at Brooklyn College for the past twelve years.

"more and more Americans will be holders of degrees that mean less and less." The idea of college education for all is profoundly attractive. If only it worked! The high drop-out rate points up the limitations of the idea. And despite these scholastic casualties, standards have a way of accommodating themselves to the mass.

There is something to be learned from the municipal colleges of New York City. Here free higher education is a birthright—but it can be exercised only by the able students. For the late bloomers and high-school goof-offs and even for those who flunk out, there is a last-chance alley. The evening schools are designed as a kind of academic purgatory in which scholastic ne'er-do-wells can do penance and the hitherto unqualified can demonstrate talents.

FALLACIES IN THE GREAT DEBATE

WE LIVE in an age of consolidation in education. There are few new ideas—most of those being argued about at the moment are simply old ones refurbished. Independent study is really the familiar tutorial, in which a student works on his own under the guidance of an instructor. Educational TV, despite its technical bravura, is essentially the lecture method. Actually, discussion about method often misses the point. More important than the specific method is the quality of the teacher. Even the so-called depth/breadth controversy is at bottom unimportant. Any significant attainment of depth—exploring limited subject matter intensively—will open broader areas of study. And a reaching out in breadth—survey courses are a good example—should provoke the student to explore some part in depth. Good teaching restlessly cuts across all methods.

But in the midst of the Great Debate, retrograde teaching plods on. Talk to students and you can compile a bleak anthology of boredom, inertia, and ineptness among teachers. The unconscionable method of stuffing the "prolix gut" of the student—the phrase is Woodrow Wilson's—is still going on. "They just give you the text," a student said bitterly. Another remarked: "My professor throws something at us, and we return it on an exam. In between we never even look at it." Perhaps the most startling symbol of complacency and disengagement is provided by a very near-sighted professor I heard about, who removes his glasses so that he cannot see his students, sits back, and pontificates. Students are indignant at first about this dreary assembly line of learning. Freshman year, a time of the greatest expectations, is often a cruel disappointment to many who had looked forward to something exhilaratingly different from high school.

Right now the tides of controversy are swirling around the Ruml Plan, which envisions a flexible pattern of lecture, seminar, and independent study. Every student would experience all of these arrangements, in varying proportions, instead of the current mixture of lecture and recitation. It may well be that all discussion is academic, for, as one authority observed, "The Ruml Plan has to happen." The economies it offers provide the only feasible way of meeting the wave of students during the next decade. (It also presents a method of raising salaries, but even that has failed to endear it to faculties, a disputatious and chronically aggrieved group.) There is little doubt that the teacher-student ratio has been a sacred cow. The former president of Fisk University once observed that without a superior teacher "the small class merely assures the transmission of mediocrity in an intimate environment." Available evidence suggests that the mere size of a class has little influence on educational efficiency. Even learning machines, Orwellian as they seem, may have a legitimate place in rote learning. And the prospect of the best teachers in the country—even in the world—becoming available through TV and in kinescope is indeed persuasive. The academic profession would do well to give up its guerrilla warfare against change. (Academicians present the paradox of being liberal politically but die-hard conservatives professionally.)

Ironically, as matters now stand, American universities rely far too much on lecturing, without the other features that the Ruml Plan includes. The usual pattern provides large lecture classes, staffed by top-notch professors, with small sections covered by graduate assistants of uneven talent. This reflects an indifference to—even a contempt for—undergraduate instruction.

Education involves, ideally, an alternating rhythm of idolatry and subversion, the authority principle and insurgency. The lecturer ravishes his audience intellectually. But the student must have the opportunity for defiance and counter-attack. And a graduate assistant, often little removed from a bright undergraduate, does not provide an appropriate object of attack. It is this question-asking, idol-smashing phase that is the key to real learning. The other—quiescence in the lecture hall—is often merely busy-work. A gifted teacher at Smith College (a school loaded with teaching talent) remarked wryly:

"Any good student wants to burn down the place by the time she's a senior."

The stringencies of the next ten years may bring about a revolution with the happiest consequences for higher education. Independent study is the first of the new models—born of the need for economy and reinforced by a hangover of Deweyism. (It is Deweyan in that it is anchored in the individual interest of the student.) Its most attractive feature is that it sets up habits which endure long after college. What, after all, can college teachers hope to achieve during four painfully unsettled years in the life of a student? All that can be done is to set the stage hopefully for a lifetime of study. If a student develops the habit of reading with discrimination, he may be reasonably well educated by the time he is thirty. Independent study provides an impetus in this direction. At the very least, the independent study candidates learn their way around a library —a rare skill, I might add, among young and old.

Through independent study students may win back their identity which rote learning kills off. I had a sobering lesson in the stultification of students recently. I asked a literature class I was teaching to read a background book and do a critical commentary. Paper after paper proved to be little more than a summary. With some exasperation I asked why this happened when I had specifically asked for critical impressions.

"It was safer that way," students said. "It's what we thought you wanted; it's what other instructors usually want."

How casually they forswear their own identities!

TIMETABLE FOR CIVILIZING THE YOUNG

IF THERE is to be life-adjustment education —and we seem to be stuck with it all the way through college—let's at least have a sensible timetable. Let's teach the basic skills where they belong—in high school. And the colleges should do something currently done in high school—done prematurely and badly: consumer training, so to speak, in the arts. In high school, there is the barbarism of the book report and the magazine "unit." (The word "unit," so modish in pedagogy, gives the game away with its phony intimation of precision.) High-school kids dutifully plow through "good" books, riffle the pages of the *Atlantic* or *Harper's,* and make callow judgments about movies and plays. Yet in college, at precisely the time when students will inherit the world—and its arts—there is little concern with them. Isn't there something absurd about colleges vacating their responsibility to mold civilized taste? It is little wonder that so many college graduates are cultural infants reading best-selling pap.

Under the influence of a distorted progressivism, colleges have pushed into areas in which they don't belong. The brash imperialism of personnel services and student activities strives to dominate the students' private and social life. In contrast with today's organized fun, there was something innocent about the horseplay of the 'twenties. At least the hell-raisers were autonomous. Their infantilism wasn't sponsored by the administration, which these days lays down the ground rules and acts as umpire for the nursery games. There is even a dreadful sameness about campus activities from coast to coast, for the personnel technicians are quick to import wholesome nonsense from other campuses.

My quarrel with the personnel engineers is that they are likely to be smiling, smiling products of Teachers College or some other emporium of inane good will and well-roundedness. And all too frequently, they are undereducated themselves. Yet they shape decisions which are academic ones, for every decision on a college campus is academic. And they fuss too much over students. I challenge the concern with student mental hygiene and the close supervision of student organizations—"psychiatric baby-sitting" someone called it. On examination, it often turns out to be something quite different: the will to power on the part of administrators. It is another instance of the invasion of privacy that characterizes our time.

The Voice of the Turtle

MERIDEN, Conn. July 22.—Beware, young lovers, wherever you are in Connecticut. The police object to couples who neck or spoon while driving.

Leo J. Mulcahy, State Police Commissioner, said today he would take steps against front-seat cuddling by motorists. He said he is "instructing our personnel that in the event they observe this type of driving they are to immediately stop the car, talk to the operator, explain to him or her the terrible consequences of this particular type of operation."

—Special to the N. Y. *Herald Tribune.*

Isn't there in all this nervous hovering over students a subtle denigration of any ideas they may have? And don't students become infected with excessive caution, with the disabling sense that their ideas are not really to be trusted? (In Queens College in New York, the two student newspapers were supplanted by a single one despite student protest. The action evoked a litany among students of the futility of their efforts.) There has to be another choice than monolithic squaredom or disheveled bohemianism.

The effort to shape personality or inculcate manners through administrative machinery doesn't work. A student develops by knowing and admiring the educated man or woman who behaves with restraint and expressiveness. What the large academic mills need desperately is what the good small liberal-arts colleges have built into them: the opportunity for contact between students and teachers, occasions for the exchange of ideas uncontaminated by notebook or grade.

THE SCHOLAR IN THE JUNGLE

THE estate of the college professor has gone up; he is even an authority figure of sorts. But this only aggravates an old and vexing paradox. If his status is high, his income is still low—probably a few cuts lower, on the average, than that of a member of the Teamsters Union. The professor's characteristic bearing is one of dignified self-pity.

The image of the college teacher has become youthful. No longer viewed as a crochety ancient with a bizarre passion for Middle High German phonology or pre-Columbian art, he has probably shed twenty years in the last few decades. He is now businesslike, brisk, and crew-cut—a cocktail-party ornament. Nevertheless, shading into the new image is the old Clerk of Oxford—prim, vaguely eunuchoid, and cloistered. People expect college professors to resist the infections of American life. (At the same time they expect them to be frantically up-to-date.) Witness the horror with which Charles Van Doren's fall from grace was greeted.

Academics, while beginning to resemble businessmen, have all sorts of special burdens. Absurd standards of gentility prevail. (A faculty tea is truly a parody of itself—the stifling *politesse,* the elegant non-communication, the shuffling for position.) But the main thing is that there isn't enough money; life is pinched and mean (except for the new expense-account aristocracy who get the big grants). A dean of a college in the Northeast told me that a good deal of his time is spent writing character references to finance companies. Thus a promotion, let us say, to associate professor is likely to be a more desperate matter than a hitch up the corporate ladder. A $400 raise to a teacher with a second or third child on the way can be a necessity for survival.

As a result, academic institutions are not gentle civilized retreats, high, high above the dark jungle of business. Alas, at precisely the time that business has become somewhat less feral, academia now dances to the beat of the tom-tom. It has come to resemble the world outside when the world outside no longer resembles what it was. The competitiveness is exacerbated by the new marginal groups now in academic life. Universities were once dominated by Anglo-Saxon oligarchs, often with independent incomes (the professor's favorite daydream). Today, second- and third-generation immigrant groups of all nationalities, in America's new status revolution, have found their way into academic life, are pouring their energies into it, and threshing about for position. This makes for a much-needed vitality but also for sharp elbows and knees when the in-fighting gets rough.

But the big problem is the relationship of the scholarly routines to the intellectual life. To put it plainly, all too often universities are simply research factories with little relationship to that bold exercise of ideas which should be the peculiar genius of an institution of higher learning. Intellectualism and teaching don't pay off; research does since it builds professional prestige—the key factor in the academic marketplace. (A marvelously funny sketch could be written about scholarly conventions in which no one listens to the papers being read. Instead, everybody mills around in the corridors and lobby converted into a shape-up or hiring hall, the chairmen looking for bright young men, the bright young men—and some not so young—looking for jobs.) The problem has got worse as knowledge has proliferated—the process of Balkanization run amuck! There are all these little fiefs of knowledge in this crabbed medievalism in which one communicates incestuously only with his scholarly first cousins. Publish or perish—the deadly old choice—has become: Publish *and* perish.

Scholarly caution can freeze the intellectual and imaginative faculties. The most uncommon kind of teaching—but the most important—is what might be called relational: seeing the connections between things, throwing bridges from one area of knowledge to another. A young

assistant professor was describing the university where he received his Ph.D.: "All that dull Germanic scholarship . . . if you had an opinion, watch out!" "The Groves of *Ac-anemia,*" a sprightly Ph.D. candidate called her university, one of the great schools of the East. "All those bloodless people," she added shudderingly.

One answer is to infuse college faculties with new life. We have writers in residence. Why not visiting professorships—or lectureships—for talented businessmen, journalists, trade-union people? (The point is to break up the monopoly now operating in restraint of intellectual trade.) The outlanders might pick up some academic circumspection, while their daring and sense of the concrete might rub off on the scholastics. It might be a good idea to apply the Antioch scheme of education to academicians. (At Antioch, students have a work period each year in which they have a chance to relate what they learn to the flinty realities outside.)

College faculties should be shaken up a little. Intramural warfare notwithstanding, life is too easy for many. There are the ineluctable corruptions of teaching: the too-quick dominion over students' minds, the sleazy omniscience, the sacerdotal aura of the lectern. It would be wise to have more faculty seminars, and teams of teachers handling the same class in active opposition to each other. All too often it is considered bad taste for professors to discuss ideas—they are inherently monologists—and some faculty dining-rooms have the starchy chattiness of a British officers' mess.

The welfare state can be just as enervating in academic circles as elsewhere. And current tenure arrangements can mean strenuous effort early in one's career and the worst kind of sloth in the middle and final stages when one should be most productive.

THE RAGE TO PUBLISH

BUT the problem of scholarship is more complex than I have indicated. On the one hand, universities and colleges should be more than conveyor belts of what has been called "tertiary education." There is, no doubt, an organic connection between first-hand scholarship and teaching. There can be a special excitement for the student in contact with a mind working on the frontiers of knowledge. On the other hand, there has to be a halt to the trivialization of scholarship, the rage to publish. "Who says that 10,000 political scientists have to publish?" a professor in California said impatiently. "How many scholars can dance on the head of an academic journal?" an observer asked. Certainly, the consequence of avid brigades of researchers trying to establish scholarly beachheads is the creation of new scholarly journals and university presses, which pour out a flood tide of the dull and repetitive—an expense of spirit in a waste of footnotes. This torrent of words threatens to engulf any reasonably conscientious reader. An English professor retorted testily when I complained about the rash of new scholarly journals: "But they're not meant to be *read.* They're just supposed to be *indexed.*"

A distinction should be made between a scholarly cast of mind and actual scholarship. Every college teacher should be scholarly; it is a minimum obligation. But he need not publish to be scholarly. In fact, the publishing process drives him into academic dustbins and deflects him from broader scholarly concerns. (In almost every English department there is the man who says, "Faulkner? I don't know anything about him or care about him. He's out of my area.") We need fewer scholarly journals and greater intellectual commerce among disciplines, especially between the humanities and the sciences. And with this retrenchment, there should be a new emphasis on teaching—undergraduate teaching—with the best people reaching as many students as possible. Scholarship, yes—but without the fetishistic overtones it now has. It may also be that if the petty scholarly empires are reduced, good scholars may turn their minds to problems of higher education instead of letting the educationists win by default.

William James' attack on the "Ph.D. octopus" is still relevant. The narrow guild character of the academic profession, with its emphasis on the Ph.D. means that talented teachers without the Ph.D. are consigned to a squalid *Lumpenproletariat.* (As our society becomes increasingly bureaucratized, credentials take on more and more importance. Consider the absurd role of the B.A. as the way to the abundant life.)

We ought seriously to consider whether there is any point in the whole Ph.D. process. In university circles, the degree is irritably dismissed as a union card, and perhaps it is nothing more than that—an indefensible form of academic featherbedding. Certainly, it would be hard to demonstrate that the Ph.D. is evidence either of teaching skill or of the ability to make an original contribution to knowledge. (Its disastrous effect on the native vigor of one's prose is notorious.) The most one can say for it is that it attests to a certain minimum of intel-

ligence and plenty of *Sitzfleisch*. Veterans of the Ph.D. grind will affirm that preparation for the orals is little more than an ordeal of memorizing. (The information promptly leaks out of the candidate's mind after the exam.) And who, in his right mind, ever reads the run-of-the-mill Ph.D. dissertation?

College teachers should be recruited in terms of realistic criteria—the ability to think, skill in imparting knowledge and stimulating thought, and that ineffable quality of enthusiasm without which the classroom becomes a mortuary.

Guild parochialism means that some of the best people have the hardest time. Dennis Wrong wrote recently of the "humanistic underground" in American sociology, fighting a forlorn battle against an IBM-oriented and lifeless empiricism. The members of this underground have to endure names like "journalist" and "literature major." The International of the discipline is rigid and unforgiving.

A professor of sociology in the Midwest offered a modest and revealing rationale for the kind of piddling research that abounds. "You see," he explained, "it provides a function for the guys who are not so talented—you know, those with an IQ of 115 or 120. On their own, they can't do very much. But give them a little area to work in, and then put together what they have done and what others have done, and maybe you'll have something. Sure, there are people like Riesman with powerful minds, but what are you going to do with less gifted people?"

THE ALTAR BOYS IN THE GRADUATE SCHOOL

THERE is no time to discuss the jolly fratricide in which scholars pummel each other in academic journals. Nor can I more than mention the opaque prose, the esoteric cult-language through which scholars protect their spooky guild secrecy. Curiously enough, a scholar whose style is uncluttered and vigorous (in a word, unprofessorial) can probably place an article sooner in a reputable national magazine than in an academic journal, so intense is the rat race. Moreover, the material will appear faster, he will be paid, and the article will evoke response from a wide range of people. When one lucky pedant does place a scholarly article, he grows old waiting for it to appear, and the only reward is a handful of free copies. (In fact, it usually costs the scholar dear, since he is likely to order a few hundred offprints to distribute among his peers.) Of course, in many academic precincts publishing in a national magazine does not rate—again, the sterile scholasticism that gives university life such a scrawny look.

This specialized intellectual efficiency, unfortunately, is picked up by graduate students, a notably timid group. Because of the recent wealth of fellowships and grants, careerism gets off to an early start among graduate students, who are inclined anyway to be opportunists at best and sycophants at worst. Weren't we better off with the lonely young men reading their heads off without a cold eye cocked at a grant of $3,000 a year? There are few graduate schools without the pale copies of the Great Men. When the altar boys receive their Ph.D.'s, they are dispatched to the hinterland with The Word. About six years ago I took a seminar at Columbia with Lionel Trilling and was appalled at the shameless fashion with which the young graduate students echoed Mr. Trilling's ideas. In all fairness, Trilling did not himself encourage this iconolatry. On occasion, he would deliberately shake up his students by taking new and unexpected intellectual tacks. But how many Trillings are there? Elsewhere, there must be Masters who relish their role.

It is well to remember that the graduate student, often subsidized by the university, desperately needs his department's recommendation. This, more than anything else, will determine where he is placed, and his initial placement may well set the tone of his career. Graduate professors, on the other hand, have the assurance of a captive and submissive audience. How good do they have to be? (The effectiveness of teaching varies inversely with the level. High-school teachers are usually more skillful as teachers—not as scholars—than college teachers. Undergraduate instruction tends to be better than graduate teaching.)

The effect of all this is narrowness, intellectual pallor, professionalization—the very antitheses of the goals of liberal education. C. Wright Mills made this bitter estimate of the younger social scientists:

> I have seldom seen one of these young men in a condition of genuine intellectual puzzlement. And I have never seen any passionate curiosity about a great problem, the sort of curiosity that compels the mind to travel anywhere and by any means, to remake itself if necessary, in order to find out. These young men are less restless than methodical; less imaginative than patient. . . . Listening to their conversations, trying to gauge the quality of their curiosity, one finds a deadly limitation of mind.

A word about faculty democracy, another sacred cow. Committees have been growing like a cancer in most colleges as the vehicle of faculty self-determination. On the surface, the trend is unobjectionable—who is against democracy?—but committees can be a curse. For one thing, teaching is a demanding art; one wonders about the wisdom of dispersing the teacher's energies. Secondly, committees and policy-making lead to a complicated network of relationships and an enforced, often neurotic, intimacy. In the old days, you hated your chairman or the president —or both. Now you hate everybody.

Since I teach only part-time I am somewhat insulated against the Gothic excesses of the academic world. But I am constantly aghast at the rocketing anxieties of friends who are full-time academics. Serving on a tenure committee is exceeded in melodramatic horror only by being a candidate for tenure. "You don't understand what we go through," a friend said to me. "You would have to be around all the time."

I have proposed some tentative answers to real dilemmas in higher education. But practical answers must flow from a vision of what the educated man should be. More than ever, we have to be concerned with first principles. We can't teach everything—or everyone. What do we really want from our colleges? That education should emerge as high drama in our popular press is at least a symptom of health.

There are even signs that the current generation of students is rousing itself from its beauty sleep. Honor students at the University of Wisconsin petitioned last year for more strenuous challenges. At Smith College, student sentiment seems overwhelmingly in favor of independent study starting in the freshman year. A Harvard student-council report lashed out at the idea that a "non-committed, objective stance is the only one that is scholarly and scientific." We may yet see that "wholly awakened man" whom Woodrow Wilson called for.

Higher education is a creature of our society, but it cannot escape its obligation to transcend it. We live in a dangerously easeful time. There is a lack of roughage in our national diet. Shouldn't our colleges and universities provide a countervailing tendency to the fat, sleek materialism of American life? Shouldn't they provide something hard and lean and spiritually purposeful? The press of students at our college gates may give us just the opportunity we need. In the past, our fear of the idea of the superior few pushed us into shoddiness and hypocrisy. We are now in position to try the leap for excellence. We have the students; we even have the teachers. All we need is the will.

AN ENGLISHMAN LOOKS AT AMERICAN COLLEGES

THE American system of general education, taken by and large, does tend to have the advantage of breadth and the disadvantage of relative superficiality, while British university education scores with greater depth but runs the risk of narrow-minded specialism. The American student is given the depth later, at his graduate school, and by the time he has finished his studies there he is just as well qualified in his speciality as is the British scholar. But it takes longer to get there.

Some people will tell you that we do in the schools what the Americans do in the undergraduate college. My own experience [teaching] at Hamilton College [in New York State] does not bear that out. The first year of the college curriculum is probably comparable with the work of the sixth form in a good English grammar school. But the whole of the four-year program is more aptly compared with a pass or general degree course at a British university; and in fact I found that a number of the more senior students turned out work which would be regarded as highly creditable in honors students over here. This would probably not be true of all colleges, but in the best examples the American Liberal Arts College is far better than we are apt to suppose. I think we can learn from the Americans. Too many academics in this country say that general education in the liberal arts should be left to the schools. If they knew something of the American college at its best, they would change their minds.

—D. Daiches Raphael, Senior Lecturer in Moral Philosophy, Glasgow University, in the *Listener*, December 24, 1959.

MATHEMATICS LAG IN MISSILES NOTED

Lefschetz, 75, Is Directing Efforts to Close Gap and Cut Soviet Superiority

BALTIMORE, Feb. 6 (AP)—in a researchers' paradise near here, an eminent scientist is trying to help plug a hole in the educational background of American missile men.

"But it's an uphill fight," says Dr. Solomon Lefschetz, the mathematician.

At the age of 75, having been jolted out of semi-retirement by the Soviet satellite launching, he directs the mathematics branch of the Research Institute for Advanced Study. He undertook the job because of a conviction that the Soviet lead in the race was b,-b.es)3-4. .s in the race for space was based on Soviet superiority in his specialty, the study of non-linear differential equations.

These are the complex systems that underlie every natural movement, including those that must be understood to develop more accurate rocket controls.

Sees Gap of 10-15 years

Compared with the Rusians, he says, American engineers are pathetically deficient in this field. He says the gap is ten to 15 years.

An idea of the complexity of the equations may be had by comparing them with linear equations, with which most United States engineers are familiar.

A linear equation may be used to describe the path of an iron ball dropped from a second-story window. But it is not refined enough to describe accurately the flight of a wind-blown leaf or rocket-fired satellite. That is a job for the non-linear equation.

"The trouble with engineers in the United States is that they do too much 'ardware' and not enough thinking," Dr. Lefschetz says. "They believe in empircism, the old trial-and-error method."

Dr. Lefschetz says the Russians, on the other hand, try harder to eliminate the error before the trial, count more on basic research than on specific projects, and manage to eliminate mistakes on the blackboard before moving to the drawing board.

"Too many American engineers are not trained beyond linear equations in mathematics," he noted. "They use the kind of technique they learn in elementary calculus and if it works, fine. And if it doesn't work, fine, too."

Seconding this conclusion is Dr. Joseph P. LaSalle, who helps Dr. Lefschetz in his work. He says one engineer told him:

"We never seem to have enough time to do a design properly, but we always have to do it over."

What is the solution to the problem of the mathematically weak engineer?

"It is a problem which I don't think anything but an angel of death can solve," Dr. Lefschetz says. "I'm afraid we won't see any great changes in what our engineers are taught until most of the old teachers die off."

Was Born in Moscow

Engineers and teachers who find these criticisms painful have at least one consolation. They come from a man who belongs to both professions.

Dr. Lefschetz, born in Moscow, was educated in Paris and came to the United States shortly after his graduation in 1905 from Ecole Centrale.

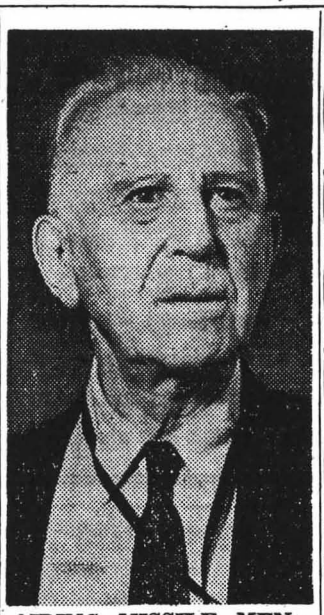
He took a job in Pittsburgh as a Westinghouse engineer, showed promise, then had his career shattered by an accident that left him handless.

He turned to mathematics. After a fellowship at Clark University in Worcester, Mass., he began teaching the subject, first at the University of Nebraska, then for twelve years at the University of Kansas.

In 1925, he joined the faculty of Princeton University, where he served as chairman of the department of mathematics from 1945 until his retirement in 1953.

He won international recognition for his work in algebraic geometry, topology and non-linear equations. Among his honors are the 1919 Bordin Prize from the French Academy, the 1924 Bocher Prize from the American Mathematical Society and Italy's 1956 Feltrinelli Prize.

When the Sorbonne awarded three honorary doctorates last fall, one went to Dr. Lefschetz. The two other recipients were from behind the Iron Curtain.



AIDING MISSILE MEN: Dr. Solomon Lefschetz, director of the mathematics branch of Research Institute for Advanced Study.

NEW TESTS BACK EINSTEIN VIEWS

1/8/60

Precise Experiments With Atom Clock and Light Ended at Columbia

By HAROLD M. SCHMECK Jr.

Physicists at Columbia University have finished a year-long series of tests that have been described as the most precise physical experiment in history.

The tests, which were started in September, 1958, confirmed again Einstein's Special Theory of Relativity by showing that the velocity of light—186,000 miles a second—is constant regardless of the motion of the observer.

The extreme precision of the research was made possible by using two maser oscillators, or "atomic clocks," invented by Dr. Charles H. Townes, who suggested the experiments.

The operation of the masers involves a beam of ammonia molecules that vibrate and emit radio waves. The frequency of the waves can be used to measure time with extreme accuracy —to one part in a million million. The frequencies of radio waves generated when maser ammonia beams were aimed with the earth's motion around the sun were compared with frequencies of waves generated when the beams were aimed in the opposite direction.

Calculations have shown that if the earth's motion around the sun did alter the observed velocity of light this would show up as a difference of twenty cycles a second between the east and west-pointing beams.

The experiments were done at at the Watson Scientific Laboratory, 612 East 115th Street. It is operated by International Business Machines Corporation, whose scientists took part in the research.

Aside from effects caused by earth's magnetic field, no variation greater than a fiftieth of a cycle was observed, according to the statement released yesterday by Columbia.

The experiments showed that less than one one-thousandth of the earth's rotational velocity around the sun could have affected the propagation of light. This figure reflects the limits of accuracy of the experimental equipment.

The results were first reported in November, 1958. The later tests were done to cover all seasons of the year. Dr. Townes and his colleagues made a further report in a recent issue of the British publication Nature.

4/13/60

NYC

6 ADVISERS CHOSEN ON WILSON PAPERS

Scholars Will Help Locate President's Data—Editor Is Dr. Arthur S. Link

Six historiians and scholars have been appointed to an editorial advisory committee to serve as consultants to the editors of the Woodrow Wilson papers.

The Wilson papers project is sponsored by the Woodrow Wilson Foundation of New York, headed by August Heckscher, and is said to be the largest of its kind relating to a twentieth-century American. It is under the editorial direction of Dr. Arthur S. Link, Wilson biographer. When the Wilson material is assembled it may fill forty volumes.

One of the duties of the advisory committee is to help locate Wilson papers that scholars so far have been unable to find. The committee has said that no Wilson letter is unimportant and in a world-wide plea has urged a dilligent search of the "old trunk in the attic" for any letters relating to President Wilson's career.

The members of the new committee are Samuel Flagg Bemis, Sterling Professor of History at Yale; Julian Boyd, Professor of History at Princeton; Katharine E. Brand of Vienna, Va., former assistant to Ray Stannard Baker, biographer of Wilson, and former head of the manuscript section of the Library of Congress; Henry Steele Commager, Professor of History at Amherst; Richard W. Leopold, Professor of History at Northwestern, and Arthur Schlesinger Jr., Professor of History at Harvard.

The Princeton University Press is to publish the Wilson papers, and Dr. Link, who now is at Northwestern University, will join the Princeton faculty this fall. A staff headed by Dr. John W. Davidson, associate editor, and David W. Hirst, assistant editor, now is processing material in the Library of Congress.

The project has received grants from the Rockefeller and Ford Foundations. The Woodrow Wilson Foundation, which has headquarters at 45 East Sixty-fifth Street, has made its own contributions and is to raise the full amount needed to complete the project.

SCIENTISTS DECRY A-WEAPON SHARING

Federation Brands Proposal 'Catastrophic Folly' That Would Lead to Nuclear War

CHICAGO, Feb. 4 (UPI)—A nation-wide organization of scientists said today that giving nuclear arms to trusted Allies, as proposed by President Eisenhower, would be "catastrophic folly" and would "virtually doom us to the ultimate calamity of nuclear war."

The Federation of American Scientists proposed instead that the United States "push with increased vigor" negotiations for the controlle cessation of nuclear tests throughout the world.

President Eisenhower urged at his news conference yesterday that the United States adopt a broader atom-sharing policy. James C. Hagerty, White House press secretary, said later that the Administration might recommend a change in the At omic Energy Act.

The Federation, which says it speaks for 2,000 scientists and engineers, called the proposal "the most dangerous type of short-sighted opportunism."

"Supplying atomic weapons and technology to our Allies—will make inevitable the spread of nuclear technology throughout the world and virtually doom us to the ultimate calamity of nuclear war," a statement by the federation's executive committee said.

"After this step, there would be no hope of preventing these devastating weapons from sweeping further into complete irresponsible hands," the group said.

It asserted that advisers who urged the program on the President "look only at our security problems for the next two or three years."

The federation said there was more hope "than most of us have been led to believe" for the success of Geneva negotiations to halt nuclear testing.

Members of the federation's executive committee are:

David R. Inglis, chairman, physicist at Argonne National Laboratory, Lemont, Ill.

Christian B. Anfinsen, chief of the Cellular Physiology Laboratory, National Heart Institute, Bethesda, Md.

Owen B. Chamberlain, Nobel prize-winning physicist, University of California.

Peter Axel, physics professor, University of Illinois.

Martin Deutsch, physics professor, Massachusetts Institute of Technology.

Arthur W. Galston, plant physiologist, Yale University.

A. H. Fox, mathematics professor, Union College, Schenectady, N. Y.

European Cooperation Produces World's Biggest Atom Smasher

2/6/60

By A. M. ROSENTHAL
Special to The New York Times.

MEYRIN, Switzerland, Feb. 5 — "Just a vague, do-good phrase," said the scientist, "but just look at the little baby it has produced."

The do-good phrase the scientist was talking about was "Western European cooperation," and the "little baby" was a huge complex of generators, magnets, computers, steel tubes and feather-delicate instruments that added up to the world's most powerful atom smasher.

"Baby" was christened today. Scientists from all over Western Europe and from the United States came to attend the ceremonies. It was named the Proton Synchrotrom of the European Organization for Nuclear Research—"PS," for short.

"PS," about five years in the making and with about $30,000,000 worth of equipment in its great insides, can send the protons of hydrogen atoms speeding faster and in greater number against a target than can any other accelerator now in operation.

The greater the energy and the speed with which the protons, the nuclei of hydrogen atoms, are sent rushing through their maze, and the greater the number produced, the greater and more precise are the experiments.

The accelerator can produce a beam of protons of 25,000,000,000 electron volts. The protons, starting from "go," reach virtually the speed of light, about 186,300 miles a second, in less than one second, and race through the machine at the rate of 450,000 times a second. Ten billion of them can hit the target of atoms in one ten thousandth of a second.

The purpose of the machine is to peer into the nuclei of atoms, to try to push further man's knowledge of the nature of matter.

Prof. J. Robert Oppenheimer of the United States, a guest at the inaugural ceremonies, said that there was still some way to go before science could put "this house in order"—this house being the nature, properties and arrangement of the unimaginably tiny "strange particles" the scientists have discovered in the study of the atomic nucleus.

"We have a long way to go before we can teach this in school and really know what we are teaching," he said.

But Professor Oppenheimer and the other pipe-puffing physicists present (scientific research on the spot showed that five out of nine scientists smoked pipes) seemed almost as excited by the way "baby" was created as by what it would do.

The European nuclear organization has done a great deal to still the fear of Western European scientists that they were doomed to fall behind in theoretical physics.

Not one nation in Western Europe could afford the machines, the laboratories and the personnel. So thirteen of them put their brains and budgets together. They created this sprawling center of research near Geneva and the center created "PS."

The "PS" at Meyrin will lose its pride of place soon to an even bigger atom smasher at Brookhaven, Long Island, but it will remain a major tool in the nuclear workshed of European physics. About half the experiments are performed by staff members and about half by scientists based in universities and laboratories all over Europe.

The center is not open just to scientists of the thirteen member nations. The Ford Foundation has provided a grant that allows scientists from other lands—India, Australia, Israel, among them—to work here.

All taken together, a French scientist said, the European Research Organization and what it has done and what it will do represent the avoidance of the "catastrophe" for European science.

The scientists, who included three Nobel prize winners, witnessed a "catastrophe" of another sort. They held a news conference and, in a center where Europe's best scientific brains work with the world's most intricate scientific tools, the loudspeaker system failed.

Physical Society to Cite Son of Nobel Laureate

Dr. Aage Bohr

A Danish professor, Dr. Aage Bohr of the Institute of Theoretical Physics of the University of Copenhagen, has been awarded the Dannie Heineman Prize in mathematical physics.

The $2,500 prize will be presented at the spring dinner of the American Physical Society in Washington April 27.

Dr. Bohr, son of the Nobel Laureate Niels Bohr, was born in 1922. In 1952 he advanced the theory of the collective model of the nucleus—a scientific explanation of the effect of the collective motion of particles in the nucleus.

He was at the Los Alamos Scientific Laboratory, which developed the atomic bomb, in 1944 and 1945.

The Heineman Prize, given by the American Physical Society and the American Institute of Physics in behalf of the Heineman Foundation, is for outstanding publication in mathematical physics.

Joseph Braitenbach

STILL ACTIVE AT 85: Dr. Alvin S. Johnson, a founder and now president emeritus of the New School for Social Research here.

EDUCATOR AT 85 SURE OF FUTURE

Dr. Johnson, Pioneer of New School, Thinks World Will Talk Its Way Out of War

Dr. Alvin S. Johnson, the educator, who is 85 today, is so confident about the future that he'd like to "hang around" for ten more years. He thinks he would be "rather amused" looking back at the worries of the Nineteen Fifties.

"We have the world by the ears now," he said in a birthday interview.

"War is too expensive in lives and hopes today. Instead, we'll argue indefinitely, and we'll become more intelligent as we argue. We wouldn't love the Russians and they wouldn't us. They'll become more scattered over the world but we'll all live on somehow."

Dr. Johnson is a founder and president emeritus of the New School for Social Research. He will be the guest of honor tonight at a dinner celebrating his birthday. And for the first time, a chair — the Johnson Chair in Economics—will be endowed at the school.

"I hope the chair will be narrow and uncomfortable," he said, "so that the man who occupies it wouldn't fall asleep at his lectures."

Dr. Johnson never delivered a lecture from a seat.

Dr. Johnson is tall, robust, gray-haired and slightly bald. He smokes a pipe continuously and likes a drink "if it's good stuff."

Dr. Johnson and his wife Edith live in an apartment on Riverside Drive in the winter and at their Nyack, N. Y., home between May and November.

He still spends several days a week at the New School, where he worries about the humanities and social sciences, which are "in a bad way at colleges," and edits the school's quarterly, Social Research.

A classical scholar who regards Tacitus and Thucydides his friends, one of the great pioneers in adult education, he is "a passionate farmer." His Nebraska boyhood was spent on a farm.

Makes Own Sauerkraut

Sauerkraut is one of his favorite dishes, but "it's like hay when you buy it at the store." Dr. Johnson makes his own in five-gallon glass jars and dills his own pickles.

He still raises funds for the New School and among his associates his letters asking for money are considered "gems."

In 1919, Dr. Johnson, along with John Dewey, Charles A. Beard and Thorstein Veblen, founded the New School as an adult education center. He still believes that "the humanities belong on an adult level" and that "philosophy comes after you are twenty."

Retirement, according to Dr. Johnson, is a "total fraud. I have more to do now than I ever had, and I like doing it."

With his seven children, six grandchildren and traditional position as older optimist of the New School, he is "happy and busy, and the two go together."

TEST FOR BEHAVIOR OF PARTICLE DRAWN

2/6/61

A method for testing how a single atomic particle, the tiny electron, behaves and thus showing whether the universe is ruled by chance was presented to the American Physical Society here, according to Science Service.

Dr. P. R. Ryason of the California Research Corporation, Richmond, Calif., said the proposed experiment could be done with equipment now available.

How a single particle behaves is the key to what is known as the Heisenberg uncertainty principle. This theory states that it is impossible to determine simultaneously both the exact position and the exact motion of an electron, since the very act of measuring one or the other affects the other factor.

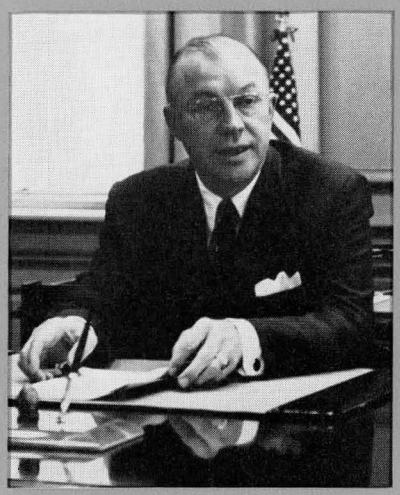
Because of this uncertainty, most physicists today believe that the probability laws covering an electron's behavior must also apply to the universe.

However, the late Prof. Albert Einstein and many other scientists believe there is underlying order in the universe, that the tiny world of the atom and the vast reaches of star-filled space can be explained by a single theory not involving probability.

Dr. Ryason's method for a direct test of the uncertainty principle uses the field ion microscope, which permits the observation of single particles. The removal of a particle from a fine tungsten tip kept at very low temperatures and viewed with such a microscope could be measured, Dr. Ryason reported in the current Physical Review, published by the American Institute of Physics here.

FEBRUARY 1960 · 35 c

The Johns Hopkins Magazine



A NEW PERSPECTIVE ON JOHNS HOPKINS

The Johns Hopkins Magazine

February, 1960 Volume XI Number 5

THE UNIVERSITY:

WHEREVER IT EXISTS, the free minds of men, urged on to full and fair enquiry, may still bring wisdom into human affairs."

With this thought in mind, Milton S. Eisenhower, President of this University, discusses in these pages some recent and significant developments at Johns Hopkins. One of these developments, the appointment of prominent Americans to re-evaluate continually the activities of the University, will provide a new perspective on Johns Hopkins.

The cover photographs are of Dr. Eisenhower and some members of the Social Sciences Visiting Committee. The other photographs in this issue attempt to illustrate in some small measure the magnitude and scope of the modern university's influence.

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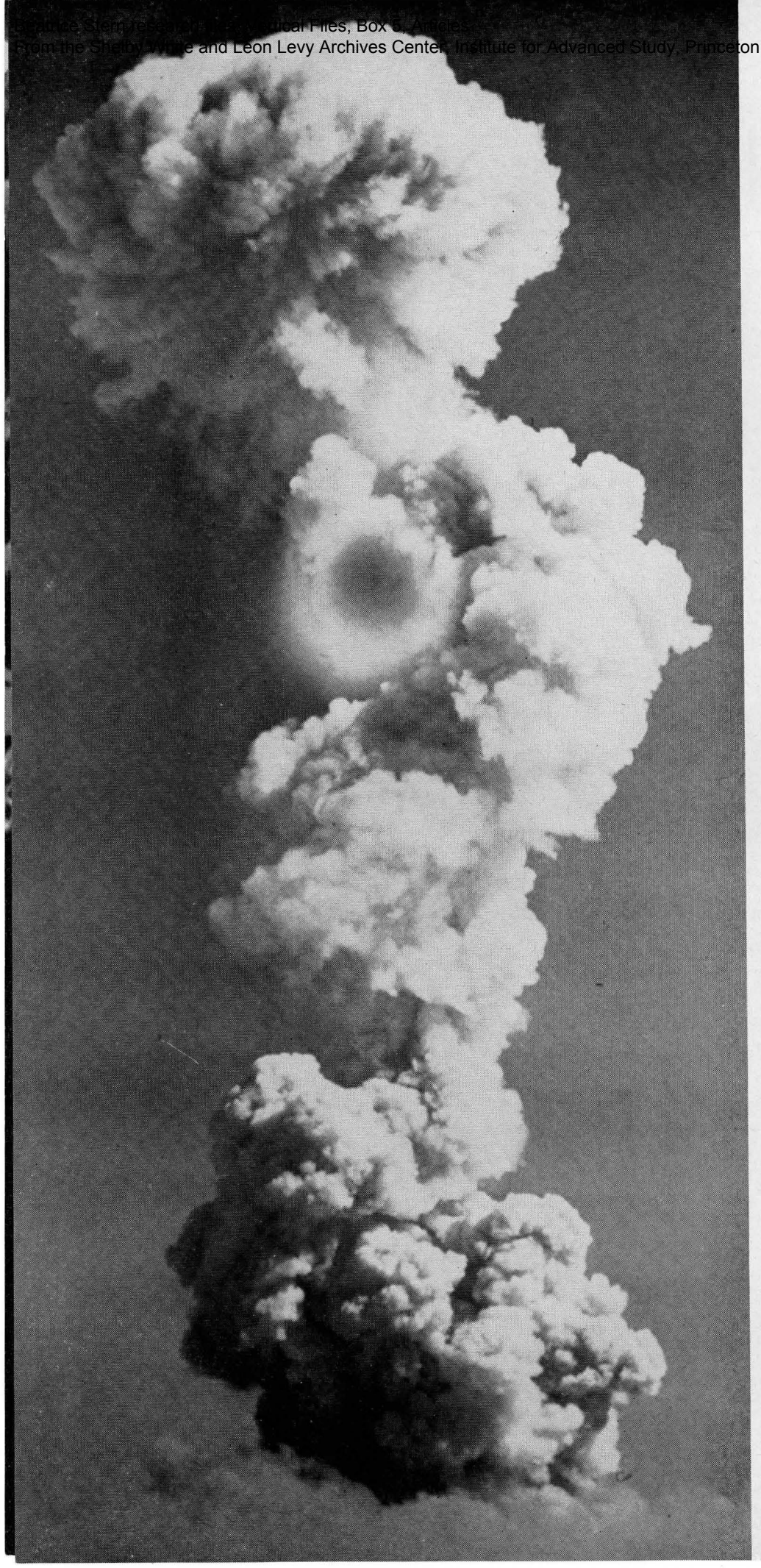


While there is peril...

and misery...

and yet, still hope...

We Have a Solemn Covenant...

As I reflect on recent events within this University and on the urgencies which face all universities, I am persuaded anew that ours is an exalted function: the search for truth and the advancement of knowledge. But as I contemplate the swiftly changing course of human affairs, it seems to me the concept of the free university has come to have a new and vital significance. In a unique sense, the independent university has a solemn covenant with mankind.

It is natural, in this reflective mood, that my mind is irresistibly drawn back to the little Midwestern town where I spent my youth. There, in a happy, self-contained community, we lived full, self-sufficient lives. Our town was isolated, virtually undisturbed by any intrusion from other parts of the world. Our thoughts were circumscribed, uncomplicated by events that took place beyond the range of our vision.

Our self-containment was not only physical, but social, economic, and political, as well. Our welfare was determined by the behavior of the weather, our own efficiency, and the bounty of the surrounding farmers.

We knew little about faraway peoples and had little motivation to think about them. Indeed, we had little reason even to anticipate the vast and perplexing changes that were soon to force themselves upon us.

That day was as different from today as the beginning is different from the end.

Suddenly, we woke to the realization that shattering changes were upon us. We neither expected them nor fully understood them, but we were quickly aware that despite perfect weather, individual efficiency, and good crops, our community could suffer distress because of an action taken in Great Britain or Italy. As our experience grew, our town shrank until it was an almost invisible dot on a global map. And, incredibly, we found ourselves plunged into terrible wars because of things that had happened in the Balkans, and, later, in Central Europe and the Far East.

Gradually, we understood that man had so shaped the affairs of the world that no community could live any longer by itself. Our nation's growing industrial machine demanded imports from some sixty other countries, making us directly dependent on their welfare for our own. With the growth of economic interdependence, with the building of economic strength, came inevitably the burdens of world leadership, accompanied by perplexing, frustrating responsibilities. We were forced into closer bonds of interest with those faraway peoples. We entered into social and cultural coöperation to assure a degree of harmony in our living together on this shrinking planet, and we found it necessary to construct systems of mutual security for the preservation of our lives and our democratic institutions.

These astonishing developments, then—faster communication, more rapid travel, mutual dependence—forced us to revise, and revise again, our attitudes and actions. We had to know more and more about more and more things, just to conduct our lives and the affairs of our nation.

Whether cause or effect (or simply a parallel development), it is useless to argue; but it is the fact that as these profound changes occurred, the wheels of knowledge began to turn—first slowly, then faster, and then at a terrifying rate. New knowledge began to bloom and burgeon in many fields. Each new thing learned—in technology, in medicine, in physics, chemistry, biology, in human arts and sciences—raised a legion of new questions which man burned to answer.

Specialization became a paramount concept. We

found that as each man concentrated on relatively few tasks, he could greatly increase his efficiency. Each man could produce far more goods and services, and these could, to mutual advantage, be exchanged for the fruits of another specialist's labors.

This trend to specialization has continued, and it is apparently only beginning. Where once occupations and professions could be numbered on the fingers, the American society now contains 42,000 specialties, only one-fourth of which can be handled by unskilled workers. A great many of these require intensive preparation for creative thought at its highest level.

The day when a scholar could stay abreast of the intellectual developments in his field with relative ease is gone. Last year, we witnessed the publication of 55,000 journals, containing 1,200,000 articles in the physical and life sciences alone. In one tiny segment of the intellectual disciplines, more than 35,000 significant articles were published.

In addition, the lag between discovery and practical application has been so foreshortened that some new techniques actually cannot be put into effect before they turn the corner to obsolescence. I am impressed with some facts about the rapid application of new knowledge: Ten years ago, it would have been impossible for physicians to prescribe 75 per cent of the drugs in common use in hospitals today. Half of all the products manufactured by our largest chemical company were unknown a short fifteen years ago. In the field of military security, a weapons system today has a life span of no longer than five years.

The hunger for knowledge seems insatiable. In essentially all disciplines, the mind of man pries into the dark areas of our ignorance. Technology, industry, and our national security all demand increasing amounts of information, ideas, research—answers to the myriad questions we pose and puzzle about.

THESE THINGS I contemplate as I walk across the Homewood campus or enter a laboratory building of the medical institutions. For here, I think, stand our universities, an integral part of a society which is at a point of grave peril.

The phrase "never before in our history" has become

trite, but it is justified. The present situation is unique because it is the first time a civilization has actually depended upon education for its very survival. Admittedly, wise men have argued soundly that the progress of mankind is indissolubly bound to education, and that, as Jefferson said, the preservation of free democratic institutions depends upon ever-rising levels of education for all people. But never before has a civilization actually signed a contract for survival with its institutions of higher learning.

The nation must have more scientists, engineers, mathematicians—more highly trained specialists in virtually every field. The need for people who are able to think creatively and imaginatively at the highest levels of capability is a critical one. This country's safety and all of human progress impose a demand for more and more truly basic research into the nature of the world and the understanding of ourselves. With the growing number of young people receiving a college education, there is an ever-increasing reliance on universities to inculcate the mental strength and spiritual vigor which will assure the nation the vitality it needs for world leadership. To educated men and women of uncommon ability falls the task of protecting mankind from the physical and ideological weapons which can cause its own destruction.

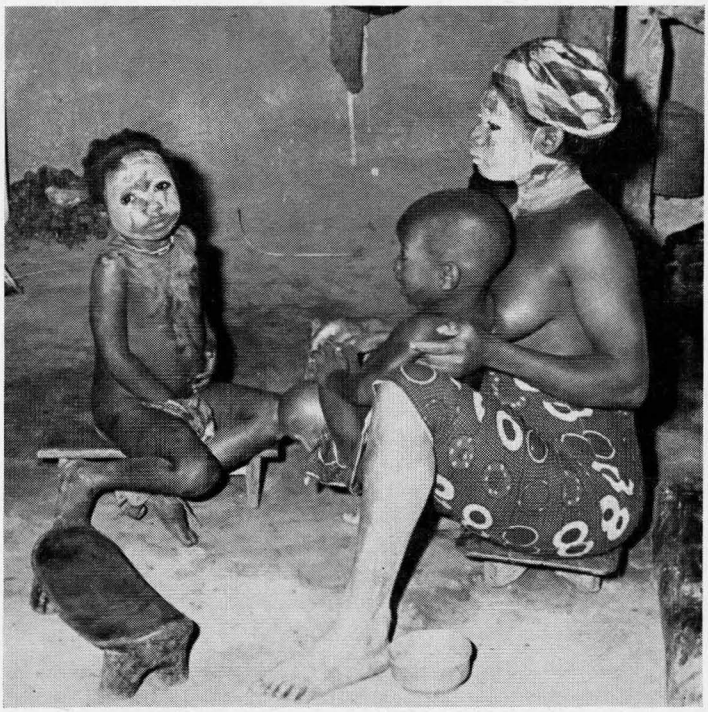
It is to our institutions of higher learning that we turn, with these grave problems on our minds, for the promise of a brighter future.

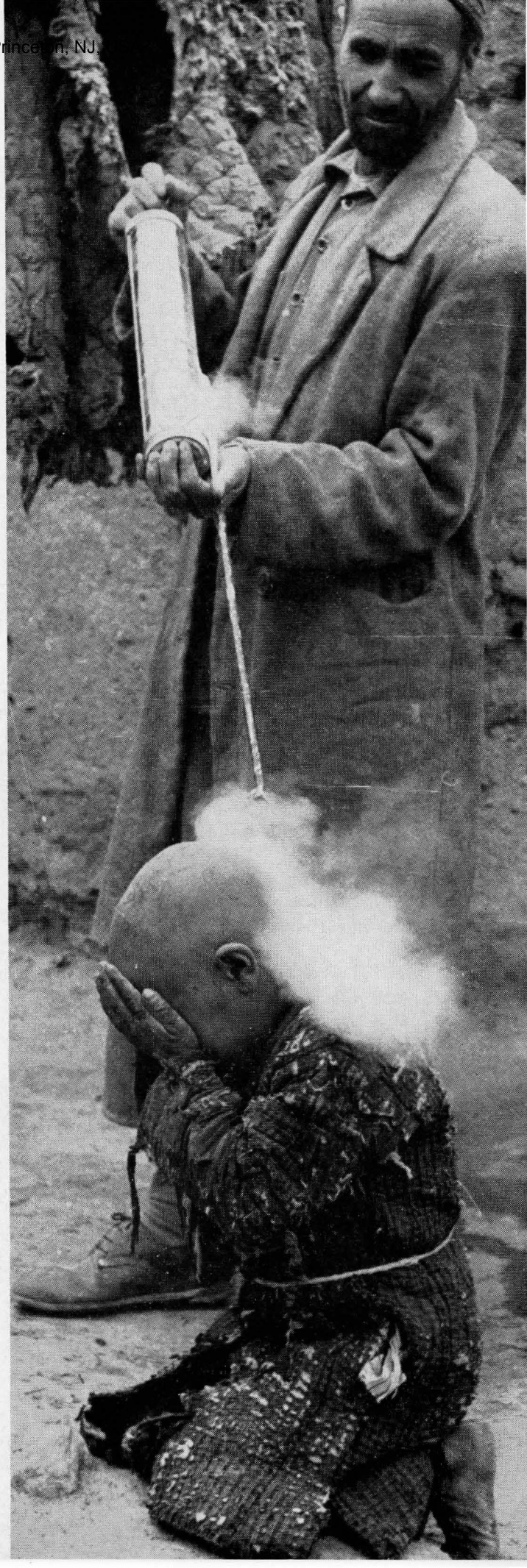
HOW CAN A UNIVERSITY meet this serious responsibility? More to the point, how can Johns Hopkins redeem its obligation in this time of crisis?

I am encouraged to believe that Johns Hopkins will, indeed, in harmony with its determined mission, perform the role demanded of it. For I have noticed here a thing which others, members of this community of scholars for a longer time, may have taken for granted. It is this: This University is imbued with a willingness to pioneer—to dare to do new things. There is within the Hopkins faculty a responsible spirit of intellectual adventure, an open-mindedness to new ideas. Change is orderly and not undertaken for its novelty, but neither is it shunned. This University is ready to grasp the nettle, to undertake those bold experiments from which great benefits for scholarship and society flow.

This is an essential characteristic, but not a new one. From its beginnings, Johns Hopkins has been ready to embark on new and challenging ventures. The University recognizes that the mind seeking truth must be as ready to acknowledge new values and new principles as it is to cherish old ones; that it must be able, without nostalgia, to forsake a concept proved untrue.

Half the world lives in the shadow of ignorance, bound by it to the past, victim of the pestilence and poverty it breeds. Increasingly, the influence of the university touches these lives and lights their path to progress.





Such precepts marked the founding of this University, a revolutionary step in itself which brought a new concept of scholarship to American higher education.

The establishment of the School of Medicine was the first successful effort to make medical research and training an integral part of university education, with the ultimate effect of elevating the practice of medicine from a purely proprietary profession to one of the most highly respected.

The inauguration of the School of Hygiene and Public Health is said to have marked "the turning point in public health education, not only in this country but throughout the world."

The determination to emphasize the fundamental scientific studies rather than technology in the School of Engineering has made that School the leader in a trend that is being proved in the practice of other engineering schools across the country.

But restricting one's search for significance to the past is a pathetic mark of decadence. And at Johns Hopkins, the precedent is to move forward:

▶ In the field of teacher education, the University has a new pace-setting program which is proving its worth and being emulated. Highly qualified liberal arts graduates, prepared for teaching careers through a well-rounded master's program, are going into secondary schools throughout the nation, carrying with them the Hopkins concept of excellence.

▶ The study of geography here is being revitalized with broad new concepts to guide the development of this important discipline.

▶ The School of Advanced International Studies is well launched on a process of development that assures that, in a very short time, it can lay claim to the highest distinction in its field of training and research.

▶ A new department has been established and is progressing with new approaches to the systematic study of social systems.

▶ A bold experiment in medical education is successfully underway, in harmony with the Hopkins mission to set standards of excellence and to help young men and women develop their minds to the highest creative levels of independent thought.

▶ The success of an imaginative program in the teaching of chemistry is marked by the fact that freshmen are posing and solving problems which usually are thought to be understandable only to those in graduate work.

▶ Branches of the University are doing government-sponsored research in such highly practical fields as missile design, space exploration, and military tactics.

These are but a few modern examples of the pioneering spirit which is the hallmark of Johns Hopkins. This is evidence that the University recognizes the role it must perform in this age.

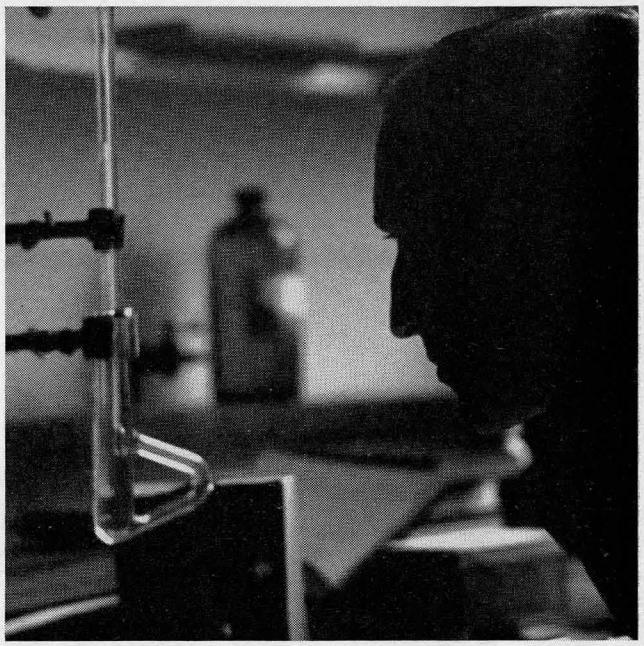
I MUST MENTION one remarkable development here which epitomizes the willingness of Johns Hopkins to accept the obligation of leadership. As I have said, an essential factor in modern life is that knowledge is burgeoning with bewildering speed. This explosive growth of knowledge is in what one of our eminent scientists has called "the logarithmic phase," and it leads to the urgent demand for even more knowledge derived through fundamental research at the highest levels.

Once we could assume that when a scholar had earned his PH.D. he had reached the point where his understanding of his field was comprehensive—that he could accommodate new information developed in his discipline on the basis of his underlying knowledge and familiarity with his subject. Now, however, a scholar or scientist may be led by his predilections into avenues which not only have not been explored, but which are so virginal that little basis for their exploration yet exists. As a result, the urge for new knowledge and new wisdom has brought into being a vast expansion of the area of post-doctoral study. Mature scholars and scientists are feeling an increasing need for higher study within a university—for more opportunity to do original research and thinking above the levels they can reach independently or in formal programs. Thus they are being attracted in increasing numbers to the distinguished universities—and, it must be said, at a more rapid rate than the universities have been equipped to cope with them. (The problems of how to accommodate this growth of higher study are already being studied by the University, and the principles involved are coming under scrutiny coöperatively by the leading universities of the nation.)

This development, nevertheless, has been a welcome one. The returning scholars bring with them vitality, new thought, and original ideas. They advance and enrich the graduate programs by their associations with faculty and students.

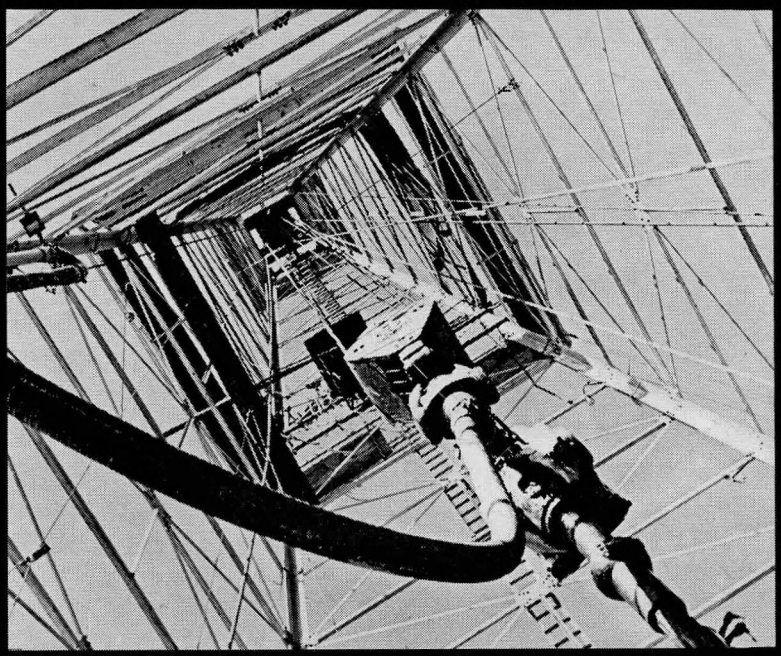
At Johns Hopkins, post-doctoral students number nearly 500 in all fields. The majority of them are working in the medical field; indeed, the 352 post-doctoral students in the School of Medicine out-number the medical degree candidates, and thus the educational program of the School is more than twice what it might seem to be to an outsider looking merely at formal enrollment figures. Post-doctoral students are also

And where there is prosperity, the university has played a vital role—

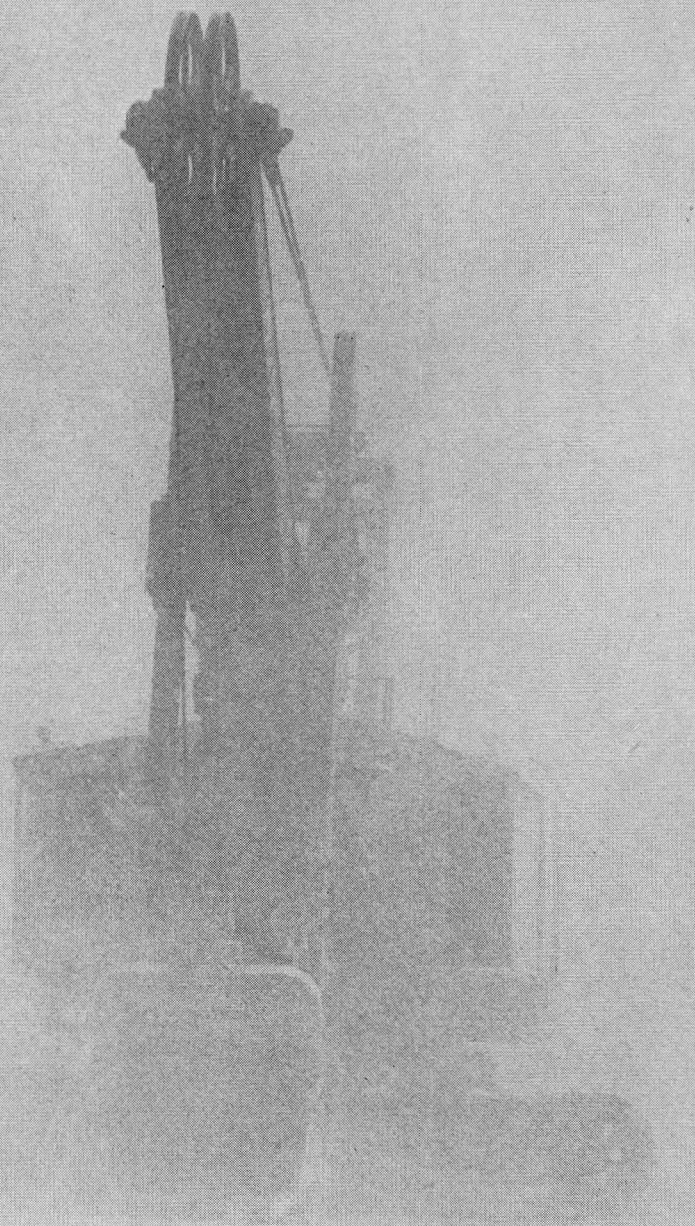


unlocking the mysteries of nature...

extracting from the earth its wealth and strength...



shaping Man's world to his needs



The university has guided as he seeks answers to the

working at Johns Hopkins in political economy, aeronautics, engineering, biology, biophysics, chemistry, physics, and many other fields. I dare say, in fact, that Johns Hopkins has a higher percentage of post-doctoral students than any other university in America.

JOHNS HOPKINS can be justly proud of its accomplishments and its plans. This University is committed, without qualification, to the highest standards of excellence in all phases of scholarly endeavor, and this gives a coherence and a unity to its personality, to its fundamental character as a place of higher learning. This thread runs through the planning and thinking of everyone here.

But quality is more than just the wishing for it. Abstract and elusive, it must be constantly sought after. Universities in this country are fortunate to be able to set their own standards. Such freedom entails great responsibility, and universities and colleges must work singly and collectively to insure that quality is maintained and raised. Every one of the nineteen hundred institutions of higher learning in this country must continually look with candor and honesty at its own efforts—and act accordingly.

From an awareness of this need, and with an abhorrence for the risk of inward, complacent thinking which spells slow decay, Johns Hopkins has made the important decision to invite candid and constructive criticism from perceptive people in areas of leadership outside the Hopkins community. Scores of prominent leaders from our society have agreed to serve on visiting committees and to re-examine continually the programs and policies of this institution. By establishing the visiting committees, the University has given itself a means for constant inspection of its activities by people with an objective point of view.

The visitors, chosen for their known interest in higher education and research, were invited to become associated with Johns Hopkins upon their election by the trustees. Some of the visitors—about 40 per cent—are alumni; some are making their first acquaintance with the Hopkins institutions. Their committees are official instruments of the trustees and serve as the board's mechanism for keeping intimately in touch with the developments in the University. The visitors have been invited by the board to develop a thorough understanding of the educational and research programs of a functional division of the Uni-

Man's searches into the past riddles of his origins and his ancestors

versity, its facilities, its faculty, its areas of excellence, its deficiencies and handicaps. They were asked to comment on the work of the division and to propose crucial questions about its program to be considered by the faculty and the trustees. Thus they have a relationship to the University not unlike that of the trustees, and they form an important additional link between the faculties and the trustees.

The visiting committees have accepted their assignments with enthusiasm and have already begun assessing the University's performance. A closer look at this place, through their eyes, may help to broaden our perspective of Johns Hopkins. The committees could not hope, at one sitting, to cover all the many facets of the University program; and so, this will not be a report in any total sense but will touch some highlights which are significant in terms of the University's present accomplishments and future objectives.

VISITING COMMITTEES

Biological Sciences

IN THEIR REVIEW, the visitors* for the biological sciences set a pattern for subsequent meetings of other visiting committees. It rapidly became apparent that the interests of the visitors would range broadly. They not only assessed the scientific and educational attainments in the biological sciences group but asked searching questions about the perennial, University-wide problems of organization, finance, and administration. During their roundtable discussions, which followed presentations by faculty members in biology, biophysics, psychology, they asked about:

▶ Faculty salaries (which have been increased, on the average, 30 per cent in the last four years but still are not considered to have reached levels commensurate with the eminence of the Hopkins faculty and salaries offered by other comparable institutions).

▶ Fringe benefits (which amount in value to approximately 10 per cent of salaries).

▶ Faculty-student ratio (about one to seven—exceedingly favorable).

▶ Teaching loads for faculty (traditionally, a faculty member of any rank teaches one graduate and one undergraduate course, devoting the remainder of his time to scholarly research and writing).

▶ And they also interested themselves in size of enrollment, costs of education, problems of fund-raising, and shortages of space and facilities.

Thus, in an intensive session, the visitors became fairly well acquainted with the Hopkins program. They later reported to the trustees their belief that the biological sciences here are vigorous and productive and are making "strong progress" under the leadership of "a very able group of professional biologists who know what they are doing."

Increased activity in both the graduate and undergraduate programs in the department of biology has required the addition of three faculty members, and the growing vitality of the research program has underscored the keen demand for added space which will be met by the construction of a laboratory wing on Mergenthaler Hall.

The visitors applauded the informality (and the atmosphere of freedom, mentioned by faculty members) which permits faculty and students in biology, biophysics, psychology, and the McCollum-Pratt Institute to overcome natural obstacles to interdepartmental coöperation. They urged the biology faculty to continue to avoid the extreme of trying to cover all the specialized areas in the enormous field of biology and the consequence of becoming superficial; and—"not because . . . there is any lack of appreciation for this problem at Johns Hopkins but because it is so highly important"—they urged continued caution to prevent students drifting into narrow specialization too soon, so that they would gain an understanding of

* The names of the visitors are listed on the back covers.

And it gives direction to as he probes the unknown

the entire living organism rather than become simply chemists or physicists with interest in biological phenomena.

The visitors indicated their pleasure at seeing that department chairmen and others with administrative duties are also top-level scientists immersed in research, and they noted that a measure of the quality of the program is the number of post-doctoral research fellows it has attracted.

When the visitors were here, the addition to Jenkins Hall for biophysics was still under construction. Since then, these four floors have been completed and occupied, giving needed space which will permit the department of biophysics to expand its teaching and research activities in accord with its long-range plans.

At the dedication of the Jenkins Hall addition, it was noted that biophysics is an emerging science, a new "multi-discipline." With the support of a munificent bequest, phases of this field of science will be studied not only at Homewood but in medicine and hygiene as well. The visitors urged that these areas maintain close, complementary relationships in order to assure that the total activity would be a truly distinguished scientific enterprise. (A new biophysics building is being erected on the medical campus, and plans are going ahead for the development of the educational and research program there.)

Finally, the visitors turned some attention to the criteria for faculty advancement and the educational mission of the Hopkins faculties. Their comment is worth quoting in abbreviated form:

In order to perform well the teaching function, they said, "it is essential that teachers of high devotion and skill be recognized early and advanced generously. The problem is made difficult by the fact that it is far easier to judge research than teaching. There are rare individuals who excel in both, and much of the brilliance of the early days of Johns Hopkins was due to the wisdom of an administration which recognized their worth. This is not a problem of the biological sciences alone; it is one of the greatest problems before any university. We offer no solution; we merely emphasize its importance."

Physical Sciences

THE RAPID MARCH of science places great demands upon faculties in the physical sciences. Because comprehension of physics is basic to study in all sciences, course enrollments in physics have quadrupled. The department has greater responsibilities to students in engineering, biology, chemistry, and the new medical education program. Similar problems are faced in departments of chemistry, geology, and mathematics. In all these areas, manpower shortages and the need for increased research and training are keenly recognized. While all reasonable steps are being taken to answer quantitative demands, the limits of space, facilities, and faculty force these departments to control their growth and to seek the optimum size of enrollment and program which can be carried on without diminishing quality.

The conclusion of the University that, being small, it must of necessity choose the fields it will emphasize and maintain highest quality in them, was strongly seconded by the visitors. Using the department of physics once again as the example, consider some of the factors that must be taken into account as it endeavors to develop in a sound, orderly way:

Enrollment in graduate programs is about eighty—probably optimum. Undergraduate majors number twenty-five—probably not full capacity. But enrollment in service courses for students majoring in other fields has so sharply risen that arbitrary limits must be placed on some laboratories and lecture courses. Crowded and outmoded facilities of Rowland Hall (built in 1930 when physics, it seems now, was in infancy) are a serious handicap. Physicists are in high demand at top salaries; many go into industry or government research rather than into universities (and yet, gratifyingly, the best of students seem to prefer an academic career). The day is gone when a student can do his experiments "in a corner of an office." Spectacular developments in science point up the need for larger, more complex research equipment. The Hopkins department, relatively small, emphasizes individual effort rather than massive team efforts, and will continue to do so.

These factors are in many ways like those experienced in chemistry, geology, oceanography, and mathematics.

The department of chemistry, which is making a trail-blazing experimental approach to the presentation of principles of chemistry with notable success, faces a special problem: the science is growing so fast that equipment rapidly becomes obsolete. New equipment

his adventures into the future for the truths of his universe

is costly, and funds are difficult to obtain. Space is needed for expanded teaching programs, research, and accommodation of the increased numbers of post-doctoral fellows who seek to study here. (Seventeen could be admitted last year; one hundred applied.)

Mathematics is broadening as a field of research in itself and as "the language of science." The faculty avoids isolation from other parts of its discipline by emphasizing fields of wide ramification: analysis, algebraic geometry, and topology. In keeping with Hopkins tradition, the graduate-level program of geology emphasizes principles rather than application and restricts its activity to the areas of its faculty's highest competence. Oceanography is also a graduate-level program, dealing with inshore and estuarine studies.

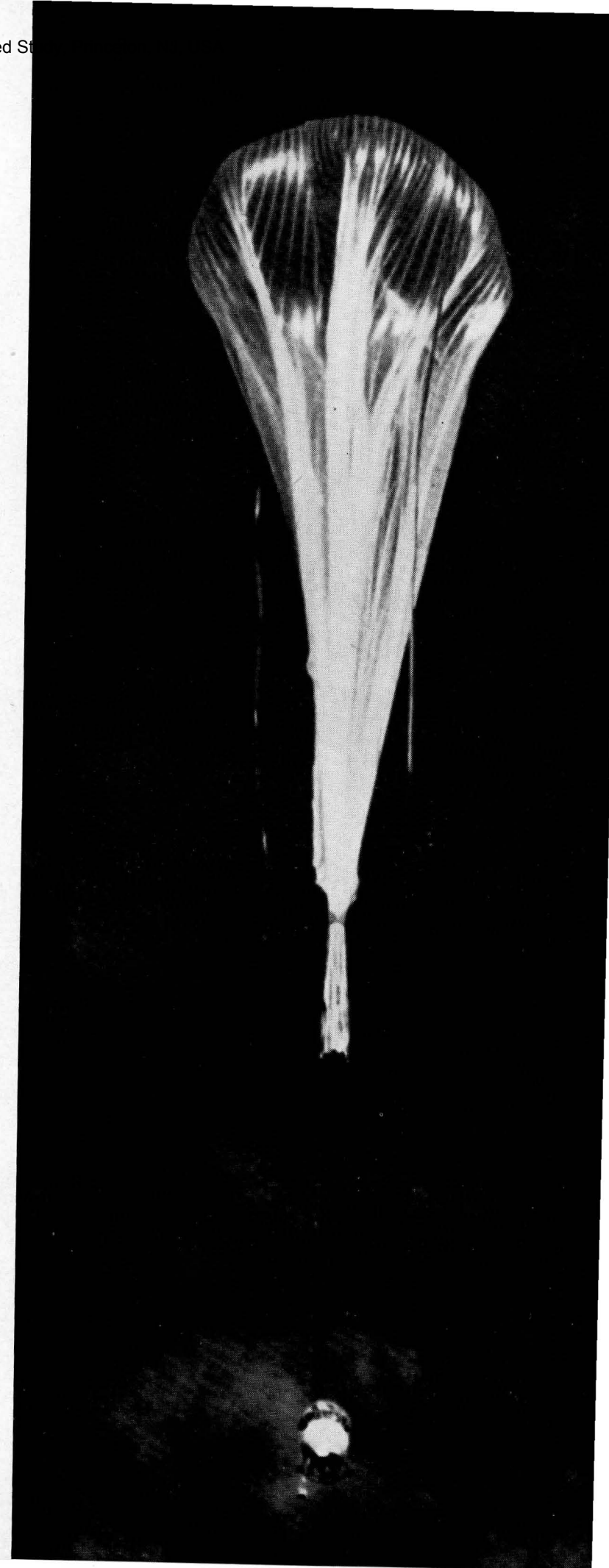
A troublesome problem, the visitors were reminded, lies in the competition among universities for top graduate students. Instead of choosing his university because it provides a program that meets his needs, the student all too frequently makes his choice on the basis of a university's fellowship program. To attract students with fine minds, a university needs adequate fellowship support.

Several visitors, themselves scientists, urged the University to determine how it can meet the increasing demand for competence in mathematical reasoning. The field of computer mathematics and numerical analysis, they said, is too important to be ignored. A faculty committee studying the problem is approaching a solution.

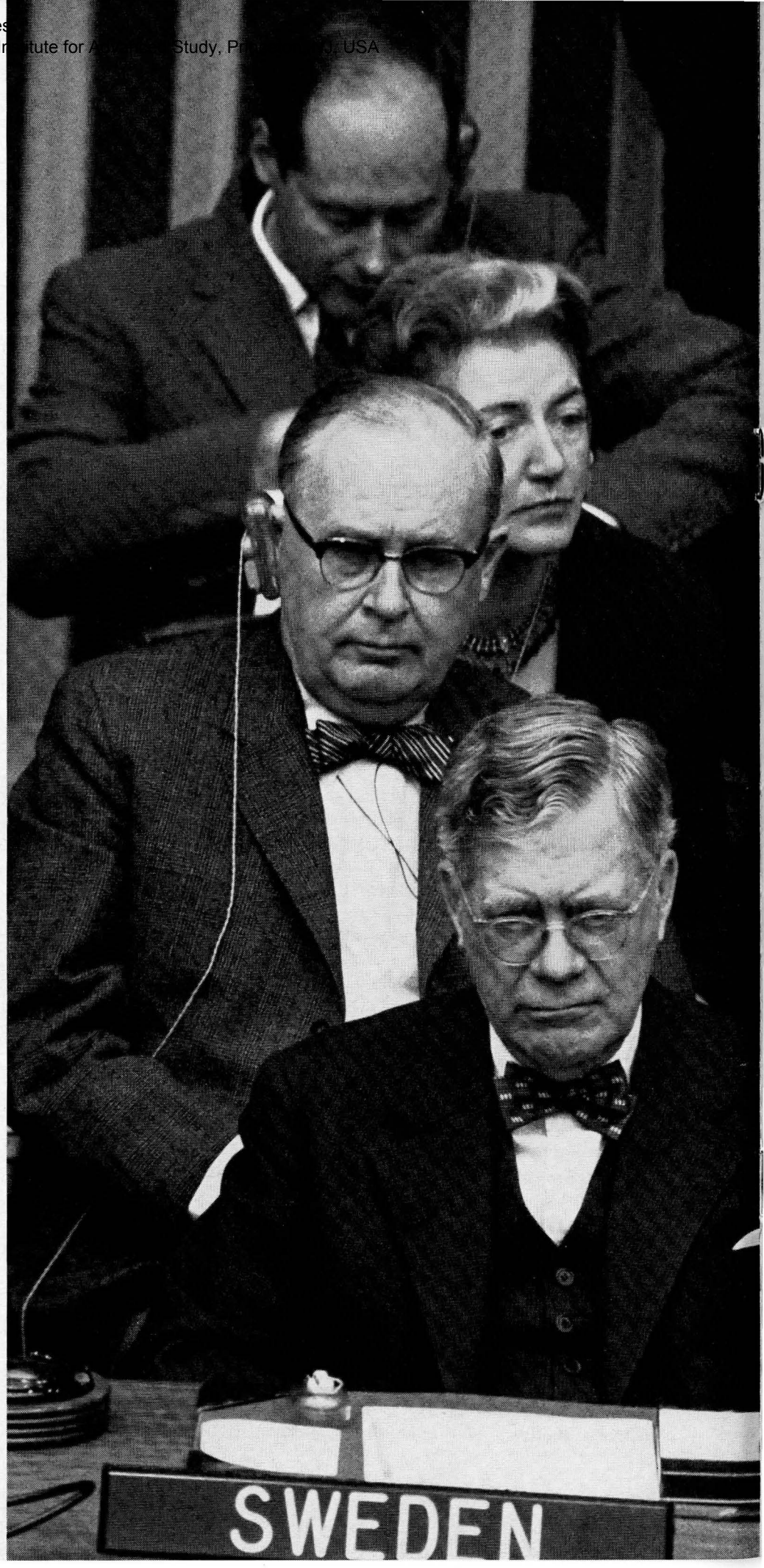
Humanities

THE SENSE OF NATIONAL URGENCY about the need for more and higher training in scientific fields tends to obscure the fact that the effort to increase quality must apply to essentially all disciplines. It is unfortunate that the enthusiasm for increased support of education which followed on the heels of Sputnik has not yet spilled over to encompass the humanistic studies in the way it ultimately must.

Interestingly, the demand on the part of students for instruction in the humanities has run ahead of the University's ability to meet it and considerably ahead of our ability to obtain funds to expand the program. Student interest in languages is rising, for example, and great numbers of students specializing in the



The university is at the center of Man's effort to understand and live with his fellow men . . .



natural sciences and other fields seek courses in philosophy and related subjects.

Student response is, of course, stimulating to the faculty members, who are involved deeply with continuing measures for improvement. Courses to answer the demand are being devised. Support is being sought for the development of a professorship in the history and philosophy of science. The need for fellowships and scholarships and the problem of support for graduate students during the writing of doctoral dissertations are receiving specific attention. A pointed effort is being made to assure that high school principals, headmasters, and counsellors are aware of programs being offered at Johns Hopkins in the humanities. The faculty in Romance languages has been strengthened by the return of Bruce W. Wardropper as professor of Spanish.

All these comments were part of the presentations by the faculty to the visiting committee which heard from department chairmen in English, German, philosophy, Romance languages, classics, history, the writing seminars, and the Oriental Seminary. At this point, having been asked to be candid and searching in their questions, the visitors turned close attention to the quality of instruction.

In such fields as languages and English composition, they asked: "Are you content with the quality of teaching at the undergraduate level? Are junior instructors being expected to perform above their levels of capability? Do students truly have an opportunity to come intimately into contact with the thinking of the mature, inspiring scholars on the faculty?"

By their questions, the visitors touched upon a point of concern among the faculty. The shortage of teachers is felt keenly at the freshman and sophomore levels, and so the use of advanced graduate students as junior instructors is a necessity in virtually all universities. This also serves another purpose, especially important in the humanities, for most graduate students in these disciplines are preparing to enter academic life. Junior instructorships help them to support themselves and give them vital experience in the classroom. Senior faculty members supervise the teaching by junior instructors in various ways. In some departments it is handled informally by individual contact; in others, notably the department of Romance languages, an intensive seminar for junior instructors gives an opportunity to improve their techniques and insure that the courses meet University standards. And in some departments, undergraduates meet with the senior professor for lectures and then break up into sections with the junior instructor for consultation and recitation. One suggestion of particular interest, though difficult to effect, was that younger scholars of acknowledged ability be engaged on term assignments to devote their full teaching time to elementary courses. The visitors encouraged the practice of *every* senior faculty member devoting teaching time to the freshman and sophomore levels.

In discussions of advanced study, some were disturbed that the requirements for the PH.D. are vaguely defined, and that students often take an inordinately long time to complete their work for the PH.D.

Social Sciences

ONE OF THE GREATEST PROBLEMS of a small university is determining how to use its intellectual and material resources most effectively. A small faculty, no matter how distinguished, cannot hope to offer courses in all the remote corners of its fields without the threat of severely diminishing excellence. Johns Hopkins has determined that it will provide instruction by the most capable and distinguished scholars available in all the disciplines necessary to give exceptional young men exceptional educational opportunities, but it will not require faculty scholars to spread themselves thin or to dilute the scholarly investigations for which they are distinguished.

These thoughts were in the background of the discussions of the visiting committee for the social sciences last fall, as they reviewed the programs in political economy, political science, history, and education. The visitors listened with interest as these criteria were set forth in explanations of the formation of two "new" departments—social relations and geography—and of a new program of teacher training.

The Isaiah Bowman department of geography is, of course, not actually new; it carries with it the traditions of distinctive beginnings. But in recent years its faculty has been depleted by deaths and retirements, and it is now being revitalized. After a lengthy search, a young and exceedingly promising scholar, M. Gordon Wolman, was chosen to give it leadership. With his faculty colleagues, Dr. Wolman has evolved an excitingly different framework for study of geography. Its emphasis will be on *processes*—the effects of man-made alterations in his environment with such physical processes as erosion, sedimentation, fertility, and plant distribution. (Whether the department is thought of as being in the social sciences or the physical sciences is moot; the fact is that it is a multi-disciplinary approach. Students will be required to be well grounded in economics, political science, and other liberal subjects as well as the physical sciences which will be basic to their study.)

The department of social relations, under the chairmanship of James S. Coleman, will offer instruction and carry on research in social systems in a systematic way—that is, using scientific and mathematical tech-

And it is at the center of Man's eternal quest to know himself

niques of analysis. For example, Dr. Coleman is using computer techniques to analyze data gathered in high schools with the aim of learning how the social system of adolescence affects the careers of high school students. The department will remain a small one, giving emphasis to work leading to the PH.D. degree.

The department of education, in addition to conducting graduate research into education in its philosophical, historical, psychological, and political aspects, leading to the PH.D. degree, has inaugurated a Master of Arts in Teaching program. Sixty superior liberal arts graduates are admitted to this program each year. In a twelve-month course, they can complete the professional requirements for certification, serve an internship in teaching for a semester in nearby public and private schools, and strengthen their chosen subject matter fields. The graduates to date have made excellent records in the schools where they serve.

Having listened intently to these explanations and reviews of the programs of each of the departments in the group, the visitors took their turn.

While applauding the philosophy of excellence, they wanted to know whether Johns Hopkins provides undergraduates with a truly liberal education. They asked specifically whether courses were offered at lower levels which would give young men broad comprehension of important inter-disciplinary areas and inspire them to be questioning, objective, and critical in their search for more knowledge. They encouraged the efforts reported to them to increase course offerings that would insure breadth in undergraduate education.

The visitors reacted with surprise to the fact that only 10 per cent of the Hopkins undergraduates who go on to graduate study stay at Johns Hopkins for their advanced work. This question has two edges. Intellectual "inbreeding" is destructive of high scholarship; but, considering the fact that Hopkins students usually do better in graduate work here than do students from other universities, it was agreed that it might be wise to encourage a greater portion to remain here for advanced study.

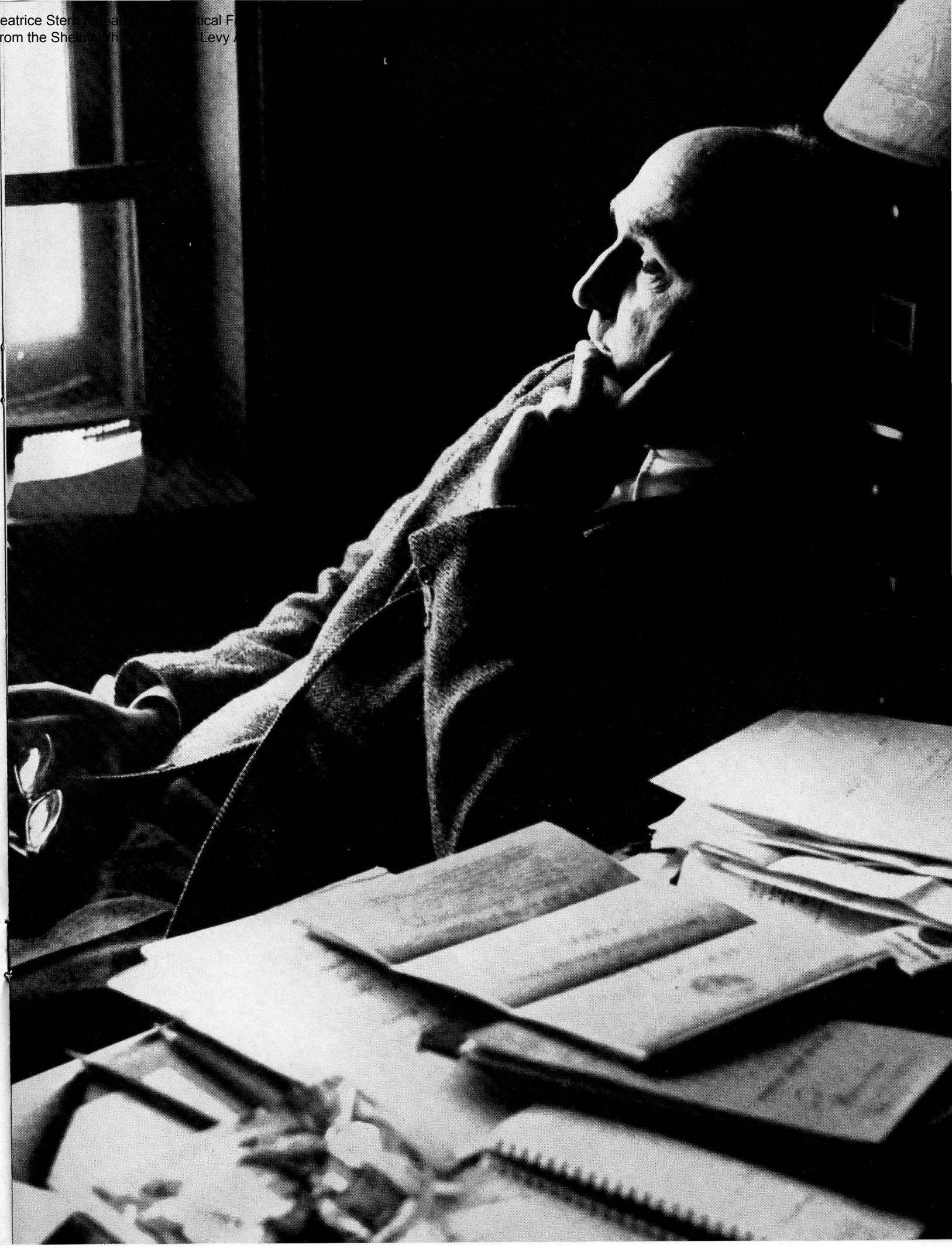
Admissions policy and the tools available for selection of students either at undergraduate or graduate level came in for scrutiny, too. The visitors concluded that the Hopkins program is not suitable for an average or below-average student—that he would waste his time and the University's resources if he were admitted to the rigorous undergraduate program. One visitor urged the faculty to find ways to dramatize the importance of the social sciences in order to attract a greater number of highly qualified applicants.

Medicine

THE MOST SIGNIFICANT experiment undertaken in medical education for many years was launched here last fall, with high promise of success. It started with little fanfare, but news of its beginnings had nevertheless spread widely, and more than 175 applicants sought admission to the new program which would let them enter the University after two years or more of college training to work toward the M.D. degree. From these, twenty-one ultimately were admitted—fourteen sophomores and seven juniors—all superbly qualified for the course. The new medical education program has been explained fully in this magazine and elsewhere, and so it is unnecessary to review it again now. Suffice it to say that it is designed to intensify and strengthen the study of basic medical science, let a student make a more meaningful transition from the liberal arts to medicine, and permit more flexibility and acceleration in the course of medical training which has been excessively lengthy. It is interesting to note that the attainments of the entering students have been such that the medical and Homewood faculties are already strengthening and improving the Year I offerings.

During the year, analytic reports of the sharply growing national demand for medical research and the serious shortage of medical manpower received close attention and were reflected in the considerations of the medical faculty. Discussion was revived on the determination of the optimum number of medical students who can be accommodated with current facilities and faculty, and specific studies were launched to decide whether the Hopkins medical enrollment can be increased. On this point, the visiting committee urged careful study of the costs involved in medical education as a basis for obtaining financial support for any expansion that might be found desirable.

These discussions brought forth a suggestion of interest not only to Johns Hopkins but to other universities—that since it is possible to accommodate more students at the clinical levels of medical training than at the basic science levels with existing facilities,



it may be economical and effective in meeting the nation's need for medical manpower to establish a number of two-year medical preparatory programs whose students could enter existing university medical schools at the third-year level. Closely allied to this quantitative problem is the one mentioned earlier in this report—the rapid growth of post-doctoral study.

All such discussions, within the faculty and with the visitors, endorsed the view that, in any planning, the University should not depart from its traditional emphasis on quality and the setting of high standards of excellence. So long as it does not threaten to lower quality, the expansion of existing medical schools of acknowledged excellence could help to meet the nation's need for added medical education facilities and personnel. Such expansion would, of course, require added financial support.

An event of particular significance in the School of Medicine was the appointment, effective next July, of Allan C. Barnes (of Western Reserve University) to the position of professor and chairman of the department of gynecology and obstetrics. The decision to combine these disciplines under one chairmanship was taken after long and painstaking consideration by a select committee of the faculty which made its recommendation only when its members became fully assured that the high standards existing under the leadership of Doctors Richard W. TeLinde and Nicholson J. Eastman could be maintained. Their recommendation was approved after further consideration by the advisory board of the medical faculty, the medical board of the Hospital, and the trustees of both the University and Hospital.

Hygiene and Public Health

MAN'S CONSTANT EFFORT to understand, predict, and control his environment for the benefit of humanity has been greatly intensified in recent years in the field of preventive medicine. Research in this field has seen a manifold increase since the height of World War II. The School of Hygiene and Public Health views a broad horizon, scientifically and geographically. More than a quarter of its 3,500 graduates have come from seventy-seven countries other than the United States, and its alumni hold influential governmental positions in many nations. Many of the leaders of the World Health Organization and other international agencies and twenty-one of the fifty state health departments are headed by Hopkins alumni. From its establishment in 1916, the School has centered its interests on the basic medical sciences, and, during the past year, in implementation of conclusions reached by the faculty after long study, it has been expanding the research aspects of its training program and emphasizing the higher levels of study in the broad fields associated with public health.

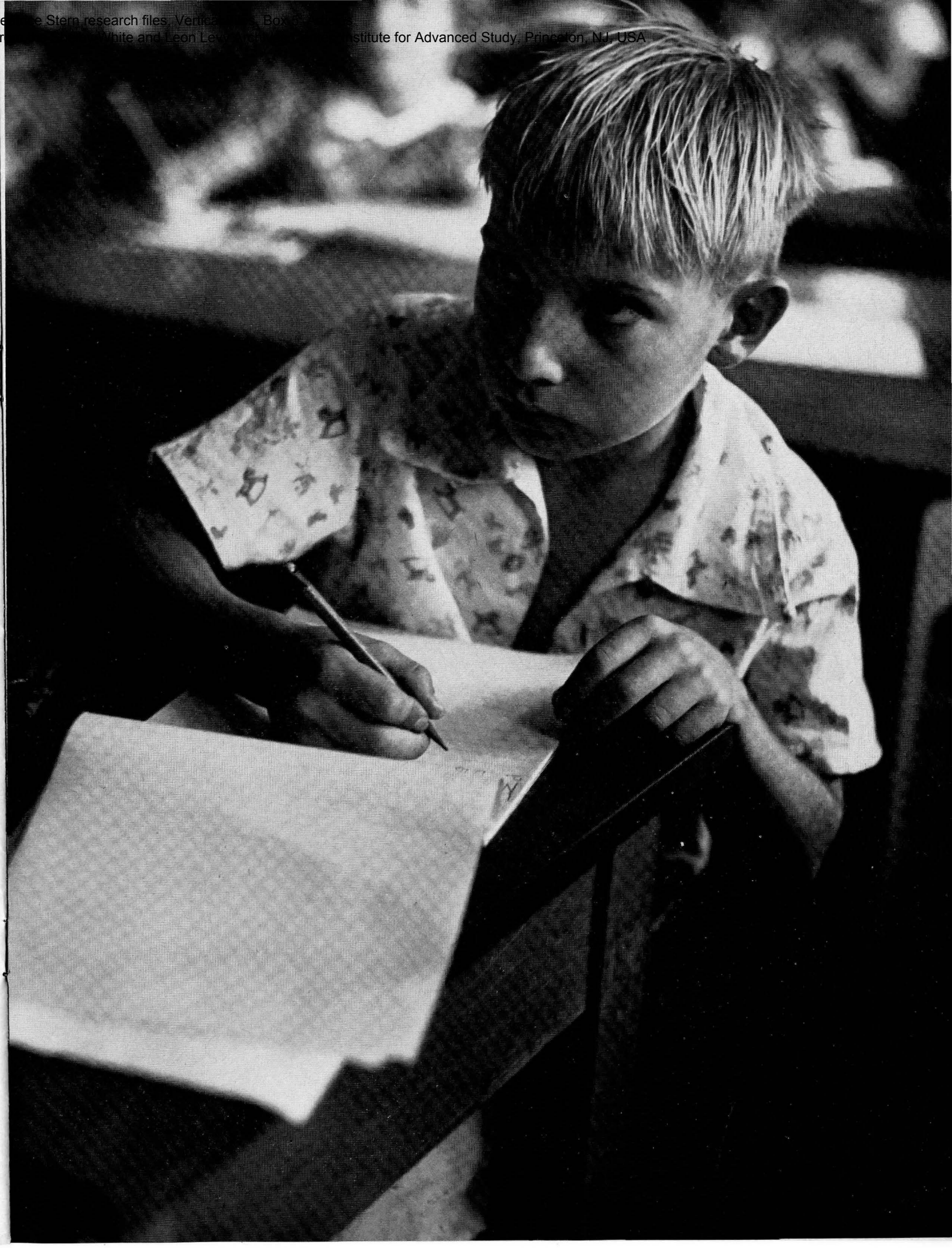
Of special significance in the past year has been the development of the initial phases of an important program of research and education in radiological health. A faculty has been recruited representing the fields of radiobiology, radiological physics, and radiological chemistry, and a small group of advanced students has been admitted for research and study. This work will be carried on in close association with a joint department of the School of Hygiene and Public Health and the School of Medicine in the growing field of biophysics, for which a building is now in the final planning stages and will soon be constructed. Increases in industrial use of ionizing radiation, the creation of waste materials which must be disposed of safely, and the use of nuclear power sources make this an important, expanding field of study which will require multidisciplinary approaches and close liaison between applied and basic phases of research. Here again, Johns Hopkins stands ready to lead.

Another significant development has been the agreement with the Leonard Wood Memorial to carry on a continuing program of research in the School dealing with the epidemiology and microbiology of leprosy.

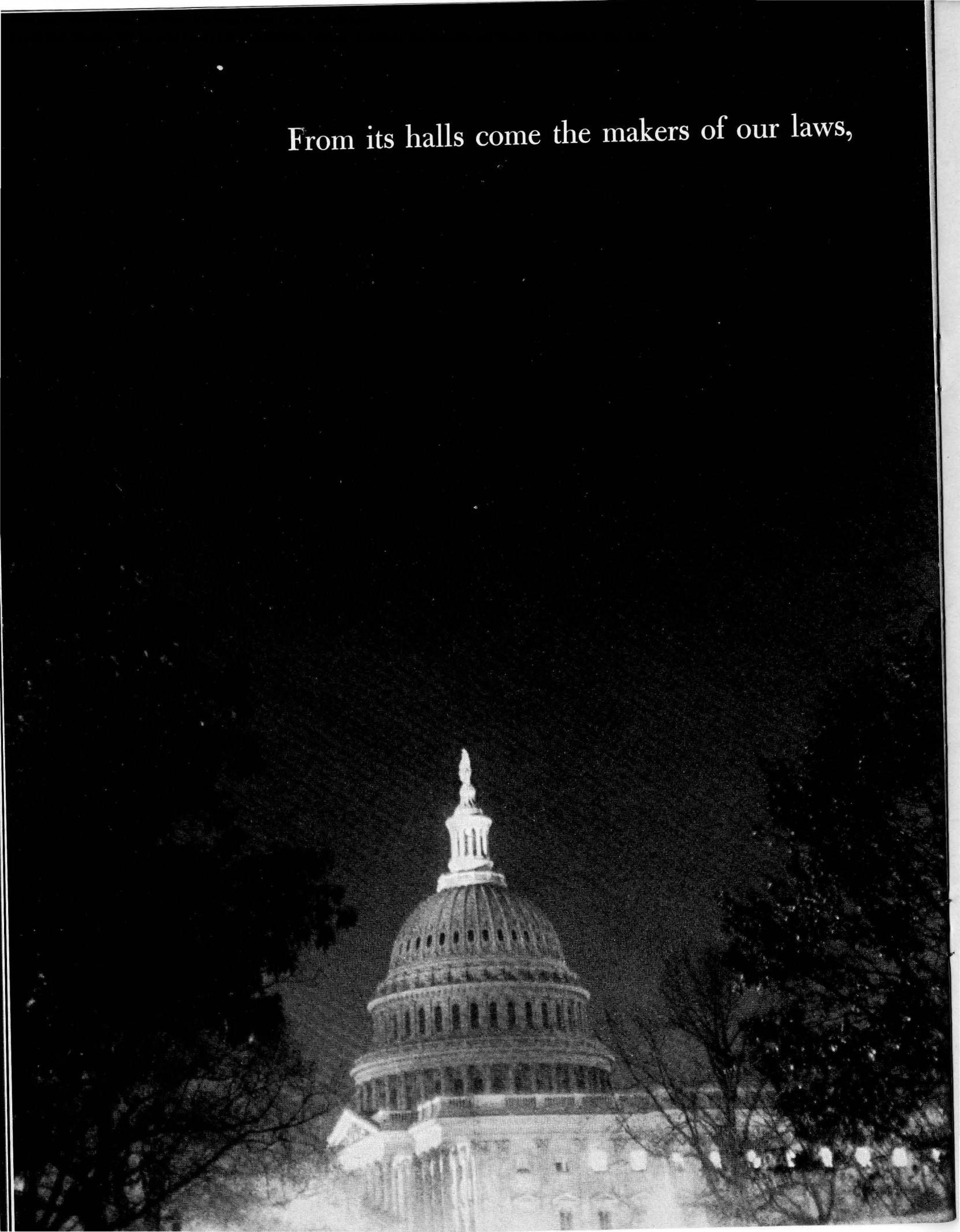
In their meeting, the visitors reviewed the broad spectrum of scientific studies undertaken in the School, ranging from biochemical studies of mental diseases to the nature of hereditary control materials, and from research dealing with causes of the common cold to the early detection of heart disease. They also sought ways to overcome the crucial shortages of specialists in preventive medicine and ways in which schools of public health could be more adequately supported financially.

Engineering

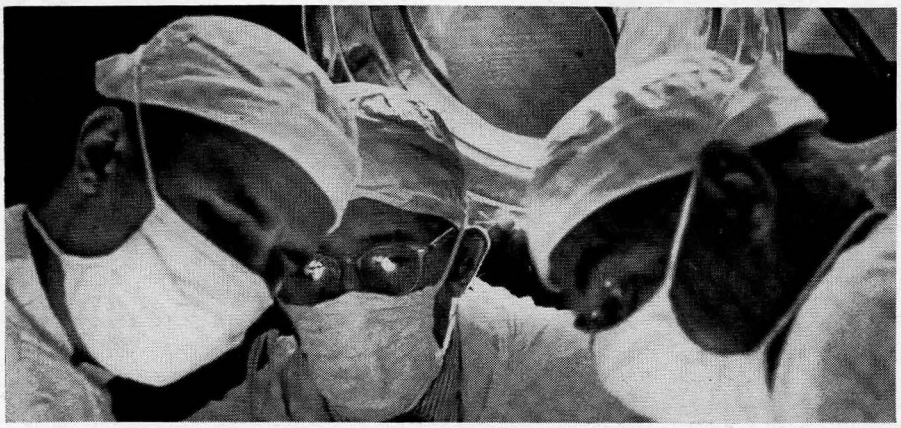
IN ENGINEERING, as in other scientific fields, there is an increasing need for men able to comprehend intricacies and principles not dreamed of a few years ago. The demand for creative engineering has almost



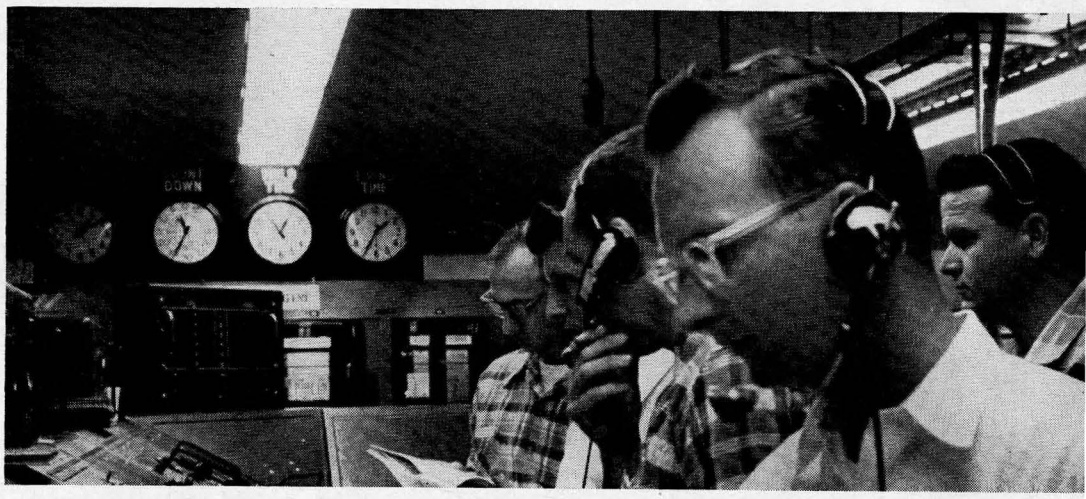
From its halls come the makers of our laws,



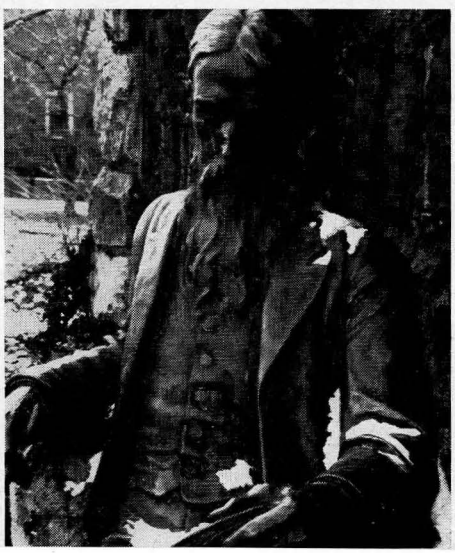
the healers of our ills,

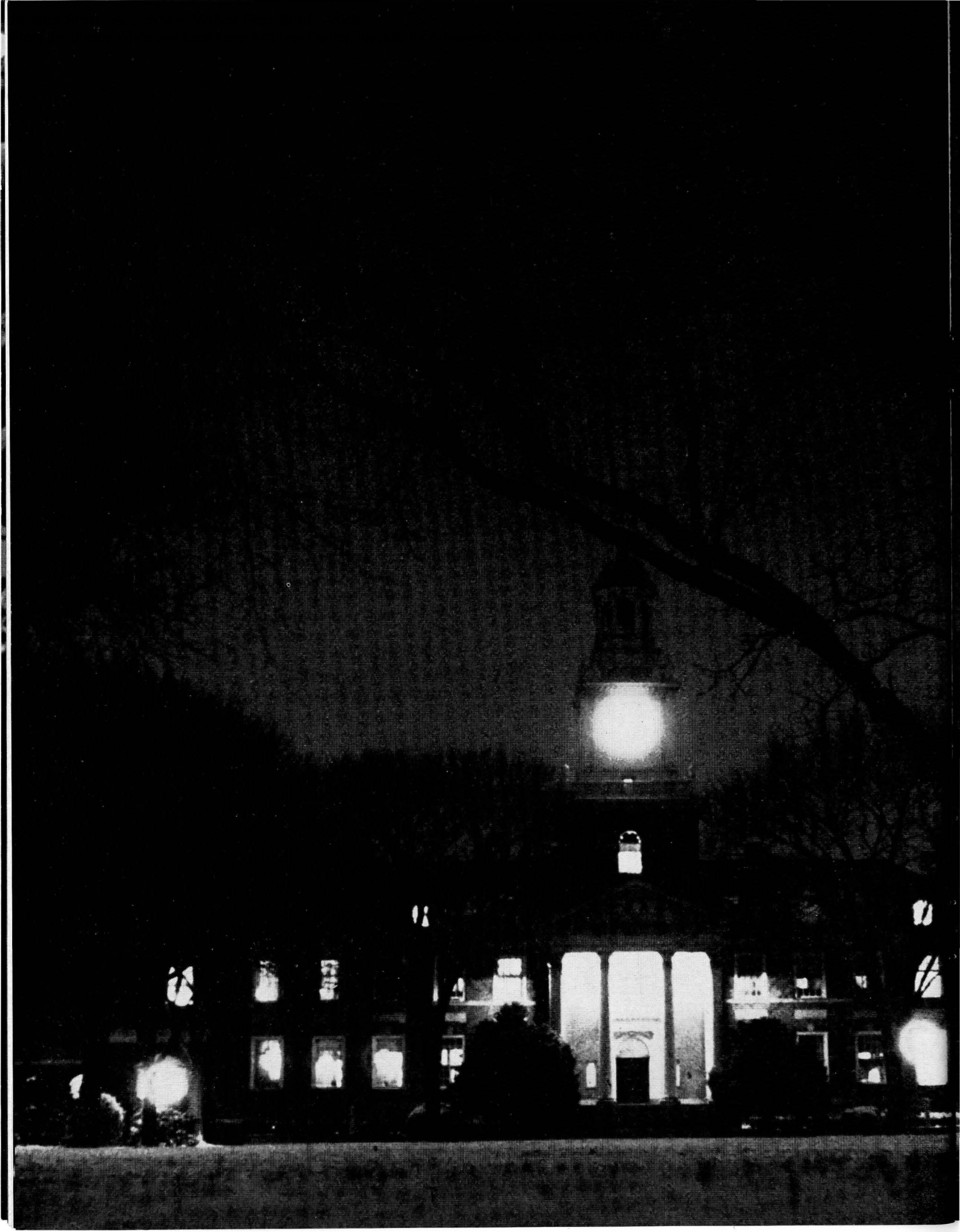


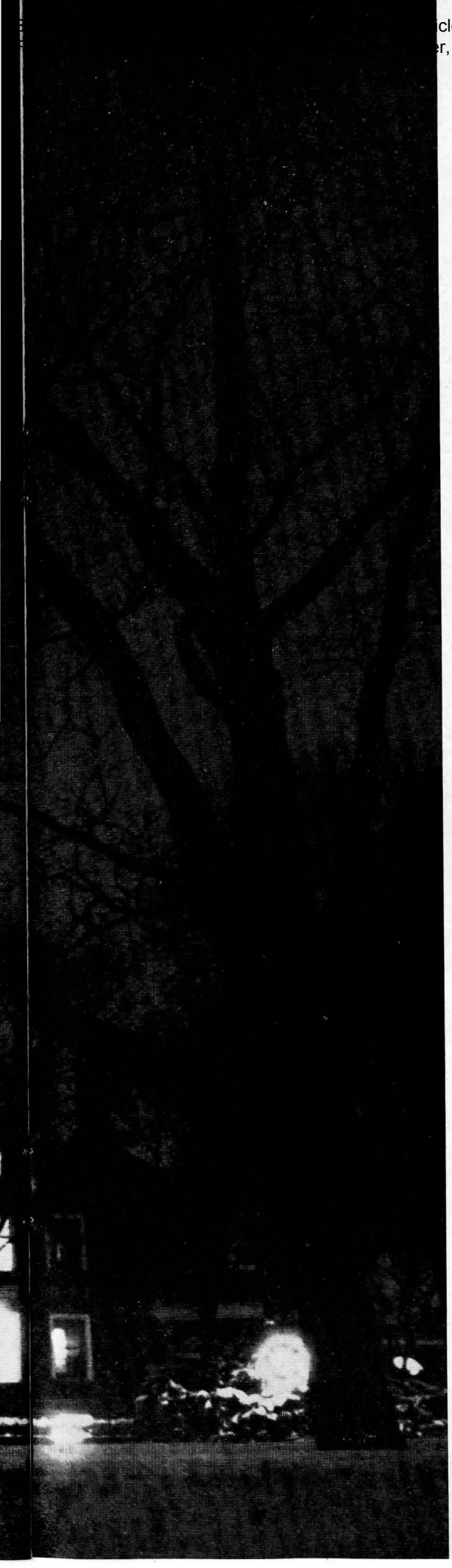
the defenders of our freedom.



It nurtures our poets, philosophers, and artists.







The university embodies
all that is man—
his struggles, his dreams;
what he has done
and what he has yet to do.

washed away the boundaries between the engineering disciplines, just as it has the traditional distinctions between engineering and "pure" science.

Realizing this, the faculty of the School of Engineering decided, in 1951, that the Hopkins curriculum should provide greater understanding of the sciences basic to engineering practice, foregoing the time-honored tradition of teaching technique, technology, and "hardware." Students now get more mathematics and more physics. Requirements in the humanities and social sciences have also been raised. And students have greater freedom in choosing courses than they had under the rigid programs of previous years.

The faculty also realized that if engineers are to meet the uncommon demands for knowledge and imaginative thought which are placed upon them, they must be men of exceptional intellectual ability. Thus the faculty has been devoting attention to two major objectives: to attract increasingly better students into the undergraduate program and to strengthen and expand studies at graduate and post-doctoral levels.

The intellectual quality of our engineering students does continue to rise. The emphasis on engineering science in itself seems to attract the better students. Furthermore, while undergraduate engineering enrollments in the nation have been falling, applications for admission at Johns Hopkins have, in fact, increased.

What results can be noted so far in the science-oriented program? Here, too, is cause for encouragement. Approximately 25 per cent of those who earn the bachelor's degree at Johns Hopkins go on to graduate study; the national average is much nearer 10 per cent in engineering. A gratifying percentage of those who attain higher degrees go into teaching, where critical shortages exist.

When the information outlined above was presented to the visiting committee, the reaction was not instantly and unanimously favorable. Unanimity, in fact, would have been surprising, for the members had been selected to represent widely different points of view. In the end, a solid majority expressed approval of the direction in which the School is moving. One member raised a question which the staff could not answer factually: "Is this new kind of Hopkins engineer useful to industry?"

A survey was conducted and the results, later forwarded to the visitors, indicated that industry is taking its full share of Hopkins engineers. The survey showed that:

▶ Of 411 who received the bachelor's degree, 85 went on to graduate study; 39 are in military service or with governmental agencies; 271 are employed in industry. (Sixteen could not be traced.)

▶ Of 127 who received the master's degree, 20 are continuing graduate study; 10 are teaching; 9 are in military service; 78 are employed in industry; and 10 (mostly foreign students who returned home) could not be located.

▶ Of 64 who received the doctor's degree, 16 have faculty appointments in universities and colleges; 10 could not be located; and all the rest are engaged in industrial or other research.

Both the studies of current practice and the efforts toward improvement will, of course, continue.

School of Advanced International Studies

FROM ITS INCEPTION, the School of Advanced International Studies has offered graduate education in languages, regional studies, and the basic disciplines associated with international affairs to equip men and women to work effectively in government and business abroad. Developing its close relationship to the University since 1950, the School has steadily increased its research activities and expanded its educational program. During the last year, it has planned further developments and improvements, and, through these efforts, the School may soon receive greatly increased financial support.

Enrollment will be expanded; academic standards will be raised; needed faculty will be added; and research activity will not only be increased through the continuing work of the Washington Center of Foreign Policy Research but will become an integral part of the program for every student and faculty member at SAIS. With the continued support of foundations, alumni, corporations, and others, the School will soon be firmly established as a place of true distinction for international studies.

In addition to its educational program the School has provided specialized mid-career training courses for field officers of the International Cooperation Administration, and faculty members took an active part in planning and presenting a Senior Training Course for the Foreign Service Institute of the Department of State. In addition, 754 persons attended the School's Conferences for Corporation Executives, in which the participants hear off-the-record briefings on issues of major interest in international affairs.

In Italy, at the School's Bologna Center, an American library (in a building which will house the activities of the Center) is nearing completion adjacent to the University of Bologna. This building, made possible by the use of *Public Law 480* funds, will be dedicated in ceremonies to take place late in March.

UNDERGRADUATE PROGRAM

BUILDING UPON some significant studies which I reported last year, the Faculty of Philosophy has made substantial improvements in the program of undergraduate instruction. The essential elements of the Hopkins idea are retained: A student should have a program tailored to his needs, and he should be allowed to progress as rapidly as his talents and interests dictate. The refinements have strengthened and stabilized the faculty adviser system and have made more explicit the levels of achievement required for graduation, thus making it easier for the student and his adviser to plan his course of study. Some broader options are available to an undergraduate (for example, he may, if he wishes, choose to major in the liberal arts rather than in a department). Some fundamental subjects are required for all undergraduate students to assure that they receive breadth as well as specialized depth from their education, and more courses are being offered for those who want comprehension but not specialization in fields outside their major subjects.

Education at Johns Hopkins is geared to accommodate the young man of uncommon intellect, in association with scholars of exceptional ability. Remarkably, more than 75 per cent of those who get a baccalaureate degree go on to graduate study. The search for those with talent, character, and a sense of purpose who can benefit most from this quality program is, therefore, a continuing effort. A particularly pressing problem has been that of overcoming the stereotype of Johns Hopkins as solely a school for medical training or for study in the sciences. The deserved reputation of the University in medicine and the natural sciences has tended to throw a shadow across the fact that exciting opportunities are available to students in the social sciences and humanities as well, and that Johns Hopkins has distinguished scholars on its faculty in history, political science, philosophy, literature, languages, political economy, fine arts, and the other humanistic studies.

During the past year, the number of applications from new students was higher than it has ever been before, and intellectual quality, satisfyingly, continued its trend of steady improvement.

Many members of visiting committees questioned whether the University is doing sufficient advance, long-range planning in connection with its undergraduate program. Dr. G. Herberton Evans, Jr., recently appointed dean of the Faculty of Philosophy, is working with senior faculty to make continuous improvements in the program and to establish policies which will stand the test of time.

SPONSORED RESEARCH

EXAMINATION OF THE SPECTRUM of research at Johns Hopkins during the past year directs renewed attention to two aspects of the total research program. The first relates to that large fraction supported by government funds; the second, to the proper balance between research and teaching in a university whose commitments are to both.

Many thoughtful persons have expressed concern over the fact that universities today depend heavily on government for the support of research, mainly in the sciences and engineering, but also to some extent in the social sciences. Certainly there is reason for concern, and a need for constant vigilance in guarding against the difficulties which could grow out of this situation.

But let us turn this statement around: Government (mainly in the years since World War II) has come to rely more and more heavily upon universities for the conduct of research essential to the national welfare and security, a reliance which is not likely to diminish. In other words, a new partnership has developed. It is a partnership based on mutual reliance and mutual benefit. It is by no means a perfect partnership but it is a workable one. At Johns Hopkins this has been amply demonstrated, for university-government collaboration, during its steady uptrend in volume, has been characterized by remarkable stability. I believe we may assume that the situation is not going to change radically.

The equipment and instrumentation needed for modern research is so expensive that only government can provide the needed support. Moreover, for obvious reasons, the search for new knowledge no longer travels in the restricted orbits of a generation ago. It has become a national undertaking with strong international implications.

This being so, it is essential that government and the universities develop and maintain working relationships

that will assure both the productivity and the continuity of the joint enterprise. This requires understanding and, perhaps, some concessions on both sides. The university scientist must learn to live with the paper work necessary to protect the taxpayers' dollars. The sponsoring agencies must recognize the values in allowing the investigator all possible freedom to pursue his studies wherever they may lead. To this end recent government efforts to provide assurance of long-range support should be intensified.

Universities would benefit if all federal agencies dealing in contracts or grants were to follow uniform, realistic practices in payment of the indirect costs of the research which they sponsor. The restriction by law or internal policy, under which some agencies pay only part of these costs, constitutes a severe drain upon university finances.

The problem of maintaining an appropriate balance between research and teaching is accentuated by the new emphasis being placed upon research as a national objective, and by the relative abundance of research funds. At Johns Hopkins especially, with its long research tradition, one might expect the problem to be acute. Here, as much as in any institution, scientific reputation and academic promotion depend upon research and publication. The temptation must be great at times to concentrate in this area and to relegate the teaching function to a secondary position.

I am happy to report that this temptation has been resisted strongly. Indeed, the faculties, without exception, are striving constantly to improve the teaching programs. Evidence of this may be found on all sides. The new plan of medical education introduced this year has placed a heavy added burden on that faculty. The Faculty of Philosophy has made significant improvements in the undergraduate curriculum and more are in sight, both at the graduate and undergraduate levels. Studies leading to the same objectives are under way in the Schools of Engineering, Hygiene and Public Health, and Advanced International Studies.

Current and projected changes will result in improved teaching methods and programs. They will also add to the burdens of the faculties. That they have been undertaken willingly and spontaneously is gratifying evidence that Johns Hopkins still takes seriously its task of providing qualified young men and women full opportunity to become the productive scholars so desperately needed by our rapidly changing society.

The dollar-volume of research activities remained relatively constant during the past year. Under the Institute for Cooperative Research, 92 faculty members carried on investigations under 120 separate contracts, involving the expenditure of $3,800,000. These undertakings provided research experience for 104 graduate and 29 undergraduate students.

The bulk of these contracts was held with the Air Force, Army, Navy, and the Atomic Energy Commission. Only a few involved classified work. In addition, research grants in the several schools, totaling approximately $7,000,000, supported investigations by several hundred faculty members and post-doctoral and pre-doctoral students. While much of this support came from governmental agencies such as the National Institutes of Health and the National Science Foundation, a substantial part came from individuals, from industry, and from private foundations.

The largest of the University's research undertakings, under contract with the United States Navy, is the Applied Physics Laboratory, which carries on research in missiles, weapons systems, and earth satellites. The Laboratory has played a leading role in the development of the Talos missile system, successfully tested on the USS Galveston last March, and in the Polaris missile system. Other ships, including nuclear-powered cruisers and conventionally-powered cruisers, are scheduled to carry one or more of the Terrier, Talos, or Tartar missile systems. The first of these, the USS Long Beach, was launched recently.

A new task was established this year in the field of earth satellites, which calls for the firing during the coming year of several satellites designed and constructed by the Laboratory.

The Operations Research Office, working under contract with the United States Army, has undertaken the assignment of developing a program which will determine the level of readiness needed by the Army to support national policy in the years ahead—a study comparable to its recently completed comprehensive effort in estimating defense capabilities against planes and missiles.

TRUSTEES

Trusteeship is a concept traditionally and peculiarly American. Other countries have only recently adopted the idea and only in small degree. The requirement of university trusteeship is, essentially, that the trustees serve selflessly on behalf of the institution, share ultimate responsibility for its welfare and its development by overseeing all its affairs.

The University's board of trustees now numbers forty-four, of whom thirty-four are voting members and the remaining ten "trustees emeritus by virtue of previous service." During the year, four new life trustees were elected by the board: Wm. Purnell Hall, Robert D. H. Harvey, Eli Frank, Jr., and Samuel Lenher. Leonard Dalsemer was nominated by the

alumni of the University and elected to the board as an alumni trustee.

The role of the trustees in the management of the University is an exceedingly active one. The executive committee of the board of trustees meets monthly to act upon business brought to it by its working committees, by the president, or by the president on behalf of the faculties. All major policy matters, academic appointments at senior grade, any decisions which may affect the future course of development of the University, major financial transactions—all these ultimately become the responsibility of the University board of trustees.

A select committee of the board supervises closely the management of the endowment investment portfolio. Another works actively with the administrative staff in screening plans and construction on building projects. Yet another deals directly with policy relating to contract research. Standing committees also review the annual budget before it is presented to the board, supervise the relationship between the University and the Hospital, and keep abreast of all important educational practices and policies by coördinating the activities of the visiting committees.

Nor is their work confined to official meetings of committees and the board; more than one member of the board has estimated that he spends as much as one-quarter of his time in performing his function as a trustee.

Two years ago, the trustees made a comprehensive study to determine the goals of the University over the next ten years and estimate the financial resources necessary to meet these goals.

After months of study and conference with the president, officers, and faculties, the trustees undertook the planning and execution of a massive development program. Their decision was that while no philosophic objection could be raised to the expansion of the University, its mission is one committing it to the highest possible standards of excellence in faculty scholarship, graduate study, and undergraduate education. Thus, since the Hopkins kind of education is expensive (costing nearly $3,000 per year for each undergraduate student, for example), it would not be reasonable to expect that sufficient funds could be obtained to finance any substantial expansion in size without a threat to quality. They therefore determined to concentrate their efforts on several high-priority needs: First, the need for an additional $1,810,000 per year in income to raise the levels of faculty salaries to the point commensurate with their contribution and competitive with those of other comparable institutions; second, the need to expand and modernize physics laboratories sadly outmoded and seriously overcrowded; and third, the need for a new central library to be constructed at the eastern end of the Keyser Quadrangle. On the medical campus will be constructed a new Children's Medical Center devoted to patient care and research into causes and cures for the diseases afflicting children. In monetary terms, the goal for new physics laboratories was set at $2,500,000; for the library, nearly $5,000,000; for constructing the Children's Medical Center, $11,000,000 (of which more than $8,000,000 is now in hand).

FINANCES

While the university has critical needs which require additional funds, its immediate financial health is good. Invested funds have reached a total market value of nearly $110,000,000, which brings in annual income of more than $3,000,000. Of this amount, however, it must be remembered that all but a small portion is earmarked for special purposes, and the need continues for general funds available for use without restriction. Income from all sources for current purposes during the fiscal year ending June 30, 1959, was $45,585,000, and by careful management the University ended the year with a net surplus in current general funds of $119,171. Expenditures under U. S. Government research contracts, including the Applied Physics Laboratory and the Operations Research Office (but not including the Public Health Service and National Science Foundation grants for faculty research) amounted to $26,589,198.

It is gratifying to be able to report that for the year all divisions of the University operated "in the black" with the exception of the School of Hygiene and Public Health, which faces severe financial problems in the immediate future. Since the School trains almost exclusively for the public service, hope is held that governmental sources will provide some of the operating support for schools of public health, and the trustees have resolved that, while they are generally opposed to the acceptance of federal government funds by private universities for operating purposes, the unique circumstances of the School of Hygiene and Public Health make it an exception.

Tuition throughout the University was raised to $1,200 per year as of September, 1959, which with some added enrollment brought in $220,000 more of general income. The cost of education, however, is still much higher than tuition. For undergraduates, for example, tuition pays less than 40 per cent of total cost at Johns Hopkins; the remainder must be made up from endowment income and support from foundations, alumni, corporations, and other sources.

McCOY COLLEGE

For FIFTY-ONE of the University's eighty-three years, it has offered evening courses—credit and non-credit—for adults. Over the years, these courses were expanded into degree programs in education, arts and sciences, engineering, and business. In 1947, these separate curricula were consolidated in a new University division—McCoy College—which now administers all late afternoon and evening courses. Last year, more than 6,500 persons were enrolled in evening classes. More than one-third of McCoy's students were college graduates; 359 held the master's degree, and 86 held the doctorate.

Through McCoy College, the University serves the community by providing opportunities for continuing education and professional advancement. Through its administration of in-service institutes for secondary school teachers, one in mathematics and one in geophysics, underwritten by the Esso Education Foundation and the National Science Foundation, respectively, McCoy helped 106 teachers to broaden their scientific knowledge and thus improve the quality of their teaching.

ALUMNI

THE ALUMNI BODY of Johns Hopkins is not large, for this is not a large university. The rolls of living alumni carry approximately 28,000 names. Nearly 5,000 of them are actively working professionally in education; 100 are deans or presidents of their colleges and universities. Within the last few years, 102 Hopkins chemistry PH.D.'s have held top executive posts in industry, and 66 were full professors of chemistry in American universities. Hopkins physicians and surgeons are eminent throughout the nation, and more than 300 have been full professors (and 1,000 more, teachers) in more than 50 other medical institutions. A recent count showed that Hopkins alumni comprised 15 per cent of the elite membership of the National Academy of Sciences. These are only a few examples of the influence of Hopkins alumni, which is obviously far out of proportion to their numbers.

In recognition of their importance to the University and their legitimate interest in its development, the trustees have increased the number of alumni-nominated trustees to six, and have lengthened the term of each to six years.

Alumni have been highly successful in the past year in helping with the search for talented students who can benefit from the unique kind of education offered by Johns Hopkins. They have expanded the membership of their organizations so that more are identified as Hopkins people in the communities where they live and work. Alumni have also materially increased their financial support of the University program, contributing to that precious pool of unrestricted funds by which the University is assured that it can maintain healthful balance and meet needs in the critical, sometimes unsupported areas.

It is gratifying to report the formation of two additional local associations under enthusiastic leadership—in Virginia and in the Detroit area—bringing the total of alumni associations to thirty-seven.

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IN THE FIRST part of this report, I dwelt on the immediate needs of a rapidly changing society, on the need for wise leadership in this time of crisis, on the very real question of survival. What I have attempted to say, in short, is that a university, though it collaborates with the past and influences the future, must be involved in the present, must respond to the immediate.

By the very fragmentary reporting in the preceding pages, I hope it is made clear that Johns Hopkins has recognized and is fulfilling this crucial obligation.

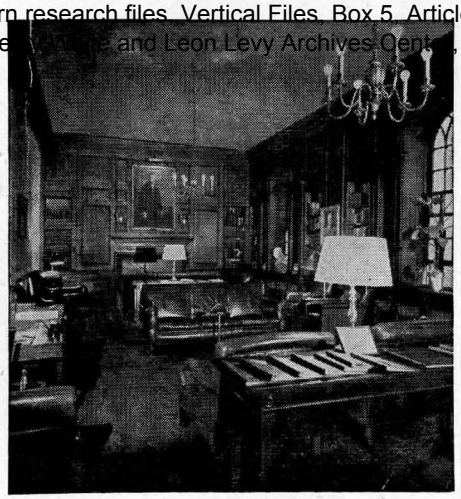
In any period, regardless of the extenuating circumstances which may be present, the traditional role of Johns Hopkins is to advance knowledge through free research and to develop others who will carry learning forward in years to come. There are significant things implicit in this.

To young people who come here seeking, we will do more than offer the facts and information they need for success in a career. We will open doors for them, fire their imaginations, challenge them to be what they truly can be. Johns Hopkins will continue to develop men of broad perspective, to provide them with a moral and cultural framework within which they can respond wisely and well to the situations they are bound to encounter.

This University must and will provide the atmosphere and facilities for free research—not only in the sciences which contribute to the national strength, but in the social studies and humanities which contribute to the spiritual and moral enlightenment of mankind.

This, "the Johns Hopkins idea," exists in every corner of the University and in its people. It is the compelling force which moves this University forward.

—MILTON S. EISENHOWER



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