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WASHINGTON UNIVERSITY

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Magazine
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WINTER 1968

The dance is just one of the lively arts that has become much livelier at Washington University since the formation of a new campus-wide, interdisciplinary Performing Arts Area. For more about the recent renaissance of the performing arts on campus, see "The Muses Are Heard," beginning on Page 26.



WINTER 1968

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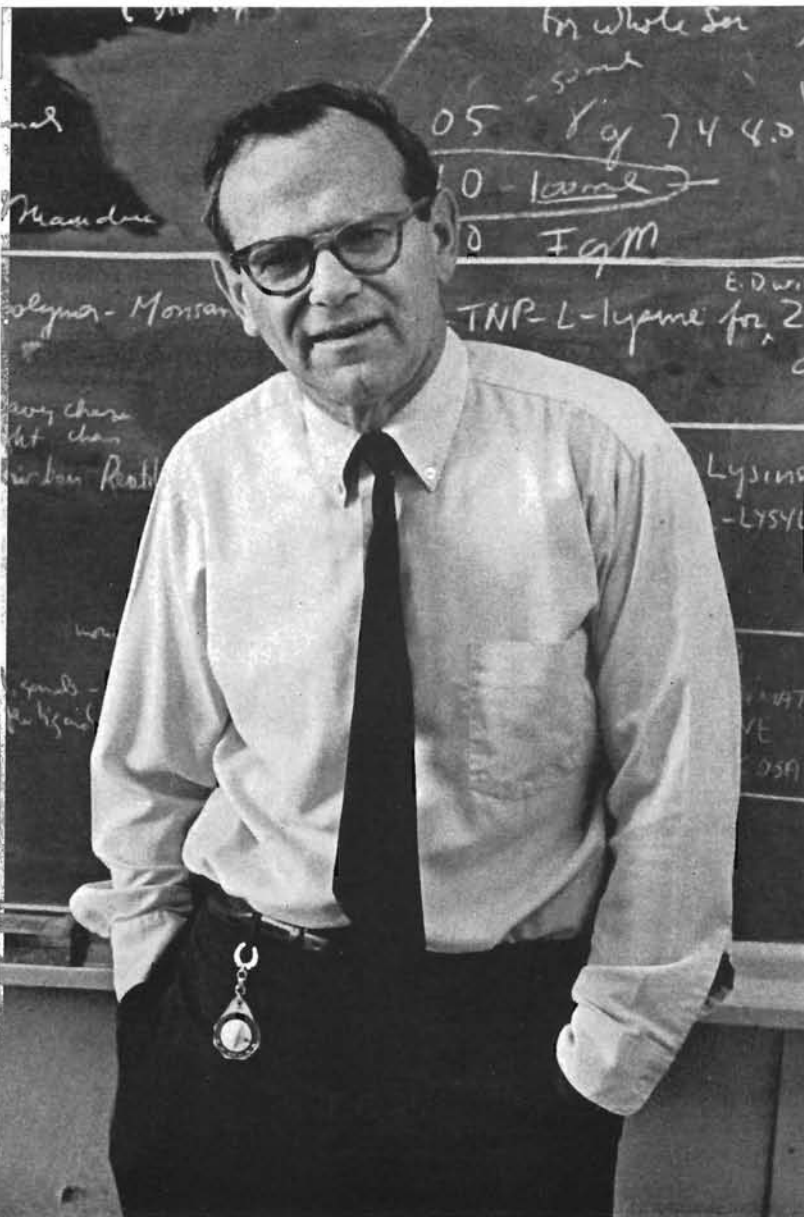
COVER: Alumnus S. Watts Smyth has become one of the nation's major breeders of Arabian horses. The cover photo shows a file of Arabians galloping across a pasture on the Smyth ranch. See Page 40.

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Surgical transplantation of vital organs, and most recently, of a human heart, has focused world-wide attention on problems in applied immunology. Aside from clinical interests, further clarification of the processes underlying immune reactions may give clues to other fundamental problems in biology. This article covers some of the basic immunology research on campus and the development of tests for reactions to penicillin.



Dr. Herman Eisen, professor of microbiology and head of the Department of Microbiology.



Dr. Charles Parker, associate professor of internal medicine and head of the Division of Immunology.

IMMUNOLOGY

MRS. SARAH HOFFMAN, 37, CHECKED into Barnes Hospital last fall with a serious bacterial infection. The bacterium was a virulent strain of streptococcus, which had infected her heart valve.

Ordinarily penicillin would have been the ideal drug for this type of infection. It is bactericidal; that is, it acts directly on the bacteria and kills them. A less potent drug, or an antibiotic that acts merely by inhibiting bacterial growth, frequently fails to clear up an infection in an out of the way place such as a heart valve. However, Mrs. Hoffman (the name is changed in this article) previously had had two severe immunological, or allergic, reactions to penicillin. Her reactions had been the rapid, life-threatening type, called anaphylaxis, in which she suffered a sudden drop in blood pressure and on one occasion had fainted.

An alternative her physician had to penicillin was a new drug, related to penicillin, which had been effective in some heart valve infections. He immediately started treating her with the drug and she seemed to be progressing well. Then she developed blood clots in her arm. This was a not uncommon side effect of the drug and her doctor was forced to stop this course of treatment. He was now faced with an extremely difficult decision. His chief hope of allaying the heart valve infection with a drug other than penicillin was gone. He felt from the beginning that penicillin would be the only completely effective treatment for this particular disease, and his patient needed the drug urgently. How could he make an intelligent decision on whether use of penicillin at this time would be worth the risk?

He called Dr. Charles Parker, head of Washington University's division of immunology in the department of medicine. He had heard of Dr. Parker's work on the basic mechanisms of drug allergy. In the course of this work Dr. Parker developed more effective tests for penicillin allergy. Dr. Parker, with Dr. Herman Eisen and several co-workers at the Medical School, had reported that skin testing with certain synthetic materials was a highly reliable indicator of sensitivity to penicillin. The physician asked Dr. Parker to give the tests to Mrs. Hoffman.

Dr. Parker's reading of the resultant reactions, or "wheals," on her skin showed that she had a moderate sensitivity to penicillin. There was a good chance that her previously intense sensitivity had abated somewhat. An element of risk of a penicillin reaction still existed, but in the absence of a very strong positive reaction to the tests, Mrs. Hoffman's physician asked Dr. Parker if he would supervise the administration of penicillin to his patient.

Dr. Parker agreed to go ahead. As in similar cases, he instituted the most extreme precautions. Mrs. Hoffman's first dosage of penicillin was only 500 units, about one-thousandth of a normal level. The action of her heart was constantly watched through a cardiac monitor; her blood pressure was frequently checked; all emergency equipment including instruments for a tracheotomy were at her bedside. She was under the constant, direct observation of Dr. Parker and other physicians for several hours after the first dosage. No significant reaction developed, and over a period of three days, Dr. Parker eased the patient up to a level of 20,000,000 units of penicillin. After several weeks the dangerous streptococcal infection had cleared and Mrs. Hoffman was discharged from the hospital. She remains in good health today with no apparent heart damage. It was an unusual recovery considering her past immunological aversion to penicillin. In the past few years, Dr. Parker has carried out or supervised more than seventy-five tests in similar patients who had been admitted to Barnes Hospital. In many of the cases the tests indicated that sensitivity had subsided and that penicillin was well worth a calculated risk in view of a rather grim alternative. And the penicillin proved to be highly beneficial.

CURRENT STATISTICS INDICATE that about 500 people die each year from reactions to penicillin. Many more patients have severe reactions, but don't die. Fortunately, such reactions are rare. "Severe reactions may occur despite a patient's having no history of previous sensitivity," Dr. Parker pointed out. "There is a need for a routine procedure which might detect individuals with this special liability."

Dr. Parker and other researchers believe that nearly all deaths and, indeed, essentially all severe reactions, could be averted with the proper use and interpretation of the panel of skin tests such as the one that was used on Mrs. Hoffman. At present the tests are being administered only by researchers in immunology under supervision of the National Institutes of Health and the Food and Drug Administration.

The reason a panel of tests is required is that after penicillin enters the body it breaks down into a number of compounds which may cause immunological reactions. Dr. Parker and his colleagues and a group of researchers at New York University who were working independently of the Parker group have identified the structures of the principal compounds involved in these reactions and have prepared the compounds synthetically. In more than 90 per cent of the cases, skin reactions to the compounds and to penicillin itself, have proved to be highly reliable indicators of whether a person is sensitive.

THERE ARE TWO PRACTICAL obstacles to widespread use of the tests. First, they take time to give and to obtain readings. Then, a certain amount of training would be required for doctors other than specialists to ensure accurate interpretations. Despite these drawbacks, some physicians believe that eventually tests for penicillin reactions may be required by law.

An important implication of the Washington University research with penicillin is in the overall area of drug allergy. It has opened the possibility of using the same experimental approach to develop more effective diagnostic procedures for other drugs that cause serious reactions. For example, about ten patients in one million may have a fatal reaction to the organic dyes used in kidney X-rays. Breakdown products of such dyes presumably are involved just as in penicillin allergy. But so far, little work has been done in identifying these products or in developing tests in this or other areas of drug allergy.

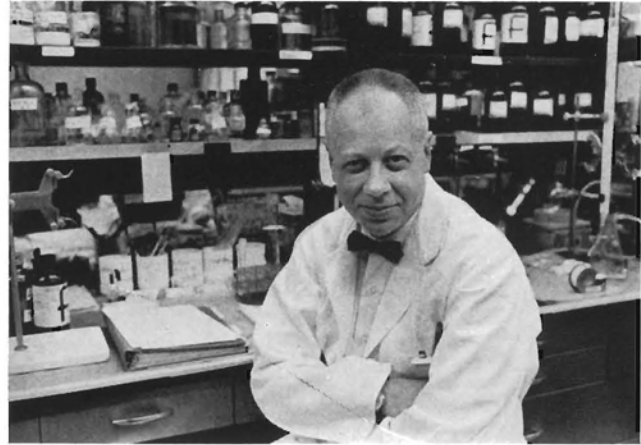
Damage to tissue from a drug reaction is brought about when the body produces proteins called antibodies. In the case of penicillin allergy, antibodies are specifically produced in response to complexes of the drug breakdown products and other proteins in the body. Drug-protein complexes can be produced in the test tube by using protein from various animal species; the complexes then can be used deliberately to generate antibodies at will in experimental animals.

Such deliberately produced antibodies have a number of potential applications, including rapid neutralization of the toxic effects of drugs in life-threatening situations. The antibodies also can be employed in a sensitive measuring technique to detect low levels of drugs in blood serum.

This latter approach has been put to use by Dr. Parker and several co-workers who recently developed the first practical means for routinely measuring digitalis levels in heart patients. The technique was perfected by Dr. Parker, who collaborated with Dr. Charles Oliver; Dan Brasfield, a medical student; and Dr. Brent Parker of the cardiology department. Cardiologists have long had difficulty in knowing whether a heart patient is getting too much or too little digitalis. The new test permits accurate measurement of the digitalis level in a few hours, and already has proved to be valuable in use with acutely ill patients at Barnes Hospital.

Dr. Parker began his work in this field in 1960 when he was a postdoctoral fellow under Dr. Herman Eisen, now head of Washington University's microbiology department. Dr. Eisen had been studying the immunological response of animals to various simple chemicals, and he, Dr. Parker and their colleagues initiated a separate project to see if some of the principles from this line of work could be applied to the highly reactive penicillin molecule. It was an example of basic research leading

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directly to the solution of a practical problem in clinical medicine.

Conversely, clinical studies often contribute to the solution of problems in basic research, and many of the body's normal vital functions have been elucidated through effects of anomalies or diseases in man. For example, the function of the adrenal gland was elucidated largely through the study of people with defective adrenal glands; much has been learned about the nervous system from the study of individuals with brain tumors. Because of the partial or complete breakdown of such organs researchers could more readily pin down their various effects in the body. And it is a disease in man which is now enabling Dr. Eisen's laboratory and other scientists to launch studies that may eventually shed light on one of the most challenging and intriguing problems in biology—understanding the basic mechanism of the immunological response itself.

That people become immune to an infection after an initial exposure to the disease has been known for many centuries. Only recently in the history of science has come the understanding that cells in the lymph tissue produce proteins called antibodies which neutralize or render inactive a foreign substance such as a toxin or a living microbe. The foreign material which elicits the immune reaction is called an antigen, whether a bacterium or a simple chemical compound. In the case of antibodies to substances such as penicillin, the body is in effect "tricked" into producing an undesirable response. The reason lymph cells don't make antibodies against proteins and compounds native to the body is that they somehow learn tolerance to them during embryonic developments. How this tremendously subtle selectivity actually occurs is one of the great puzzles of biology.

A flurry of activity in immunological research took place in the early part of this century when biologists

were able to produce most of the vaccines which are used to this day. In the past ten years, one problem that has contributed to renewed interest in applied immunology has been that of immune rejection of organ transplants. Antibodies will attack a foreign protein from another person just as they would attack a microbe. Unless long-term methods of suppressing the immune response are found, transplant surgery will remain a seriously limited procedure. In a wider and more theoretical sense, biologists feel that it is now within their grasp to understand the precise nature of this fundamental behavior in man and in all higher animals.

"We want to understand how an animal can respond by making an almost limitless variety of antibody molecules against an unlimited number of different antigens," Dr. Eisen said. "A man can respond presumably to a million or more different antigens."

ONE THEORY OF HOW the immune mechanism is triggered is that millions of "sentinel antibodies" circulate continuously in the blood serum. When some of them recognize a particular antigen they somehow signal the lymph cells to go into mass production of the corresponding, specific antibodies.

"In nature, millions of mutants are generated in the hope that one will respond especially favorably to its environment. In immunological systems, it appears that millions of different antibody molecules are made simply to await the antigen that will apply. That's Darwinism with a vengeance," Dr. Eisen said.

After the signal for antibody production has been made, a variety of lymph cells produce antibodies which are all very similar in overall structure. But each cell produces slight variations in the type of antibodies it makes, each antibody having a unique specificity to a foreign agent. Each of these thousands of sets of antibodies apparently reacts with an antigen in a subtly different way. Obviously,

this produces an experimental nightmare for the immunology researcher. What he has long hoped for has been the chance to observe one homogeneous type of antibody—available in large amounts—in order to map out precisely how it attaches itself to the antigen for which it was made.

IT HAS BEEN KNOWN for some time that myelomatosis, a cancer of lymph cells, results in the production of proteins with the same general structure as antibodies. But each tumor, which originates from a single cancer cell, produces a homogeneous protein. Hundreds of the homogeneous proteins are now available, many in large quantity. But the question as to whether they have antibody activity has been difficult to answer because each of these unique proteins might behave as a specific antibody for any one of thousands of different antigens. Recently, however, Dr. Eisen, in collaboration with Dr. Russell Little, came upon a rapid screening process that made it possible to examine literally dozens of these proteins a day for their ability to combine with a particular antigen. This has led to the tentative identification of antibody reactions in proteins from two different myeloma tumors.

Myeloma tumors also occur in mice; like the human tumor, each mouse tumor makes a unique protein. "How the tumors became available in mice is an interesting story," Dr. Eisen continued. "It came from an accidental observation at the National Institutes of Health. In the course of an experiment there, it was found that you could cause myeloma tumors simply by injecting mineral oil into the mouse's abdominal cavity. A given tumor can be transplanted into dozens of other mice and then from each of those mice, transplanted into hundreds more, and so on. It has turned out that through many generations of transplants a given tumor produces the same kind of homogeneous protein. Michael Potter at the NIH has been doing this for the last ten years. He has had hundreds of

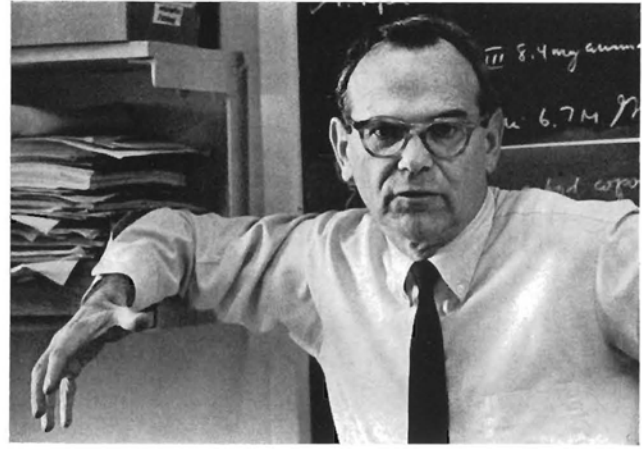
these tumors going. But it has not been possible previously to show that any of the proteins have antibody activity. Dr. Potter started shipping serum from his various tumor-bearing mice for screening. This work is still in progress, but it already looks as if we have found proteins with antibody activity from two of the tumors."

One of the immediate plans is to grow enough of these tumors in mice to produce literally grams of pure myeloma protein that can be analyzed in detail for antibody activity and firmly establish the validity of this research method.

Twenty years ago, while doing research at New York University, Dr. Eisen and Dr. Fred Karush established that the conventional antibody molecule has two relatively small "active sites" where the actual binding with an antigen takes place. This observation has been verified by other researchers many times over. Therefore, one standard test of whether a protein is exhibiting antibody activity is to look for two binding points on the suspected antibody molecule. Both of the proteins from the myeloma tumors identified this fall are being studied with this criterion in view.

Aside from its importance to basic biology, if the procedure of Dr. Eisen and others proves to be correct it could provide a highly useful biological system for researchers in applied immunology. In the area of suppressing immunological response to transplants, suppressive drugs do exist. But they also suppress the synthesis of non-antibody protein (in addition to opening an individual to various serious infections). To check whether certain chemicals can turn off antibody formation without interfering with the synthesis of other proteins is highly complicated if the tests are run on laboratory animals. The many variables involved in testing animals would be drastically reduced if one could experiment instead with myeloma cell cultures in test tubes, all cultures producing the same type of antibody.

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One of the several questions being asked in applied immunology is: are antibodies themselves a cause of certain diseases? Many instances have been recorded where lymph cells produce antibodies that attack an individual's own tissue—a so-called autoimmune response. This type of antibody has been found in a number of diseases, including rheumatoid arthritis. High levels of antibodies to a person's own tissue have been found in a disease called lupus erythematosus, which usually afflicts women. This severe ailment is marked by inflammation throughout the body, and death is caused most frequently by kidney failure.

ABOUT ONE IN 50,000 babies is born with a deficiency in his ability to make antibodies and, as a result, is extremely vulnerable to infections. He can be given antibodies through injections of plasma from donors, but resistance from this source depends on what infectious agents the donors have been exposed to. Without treatment, infants with this deficiency usually die of disease within three or four years.

Dr. R. R. Porter of Oxford University wrote in the October, 1967, *Scientific American* that when an understanding of the operative mechanisms of the immunological reaction is finally attained, "It should lead to ideas about how to change, stimulate or suppress immune reactions as medical practice requires and therefore should be of great practical value as well as solving one of the most intriguing problems in biology."

It is quite possible that eventual description of how circulating antibodies are synthesized so that they will combine with the appropriate antigen will lead to valuable ideas in applied immunology. Circulating antibodies control a great variety of infections. They are, of course, the front line of resistance that is produced by the many effective vaccines which now exist.

But there is a second type of immune response, a de-

layed type of response, which seems to be critical in some diseases. And much less is known of its nature. Resistance to tuberculosis apparently depends on the delayed immune response. The delayed response is related directly to the lymph cells themselves, or possibly to an antibody bound to the surface of these cells. Aside from a possible critical role in resisting intracellular infections such as that due to the tubercle bacillus, the delayed response may also be important in immunological rejection of organ transplants. Dr. Parker's laboratory is trying to identify the nature of antibody-like receptors that are bound to lymph cells and are believed to be involved in the delayed immunological response.

Not the least motivation for the recent influx of biologists into immunology is a feeling that these studies may yield knowledge of related, fundamental problems in biology. The detailed response of an animal to an antigen is an interesting "model" of cellular differentiation in general—the process by which organisms achieve their uniqueness.

"The whole process by which an antibody molecule recognizes its antigen and combines with it to make a stable complex is very much like the process involved in how cells interact and recognize each other. It's something like the problem of fertilization—how a sperm will unite with a corresponding ovum from only the right species. It's also much like how oxygen and haemoglobin combine," Dr. Eisen said.

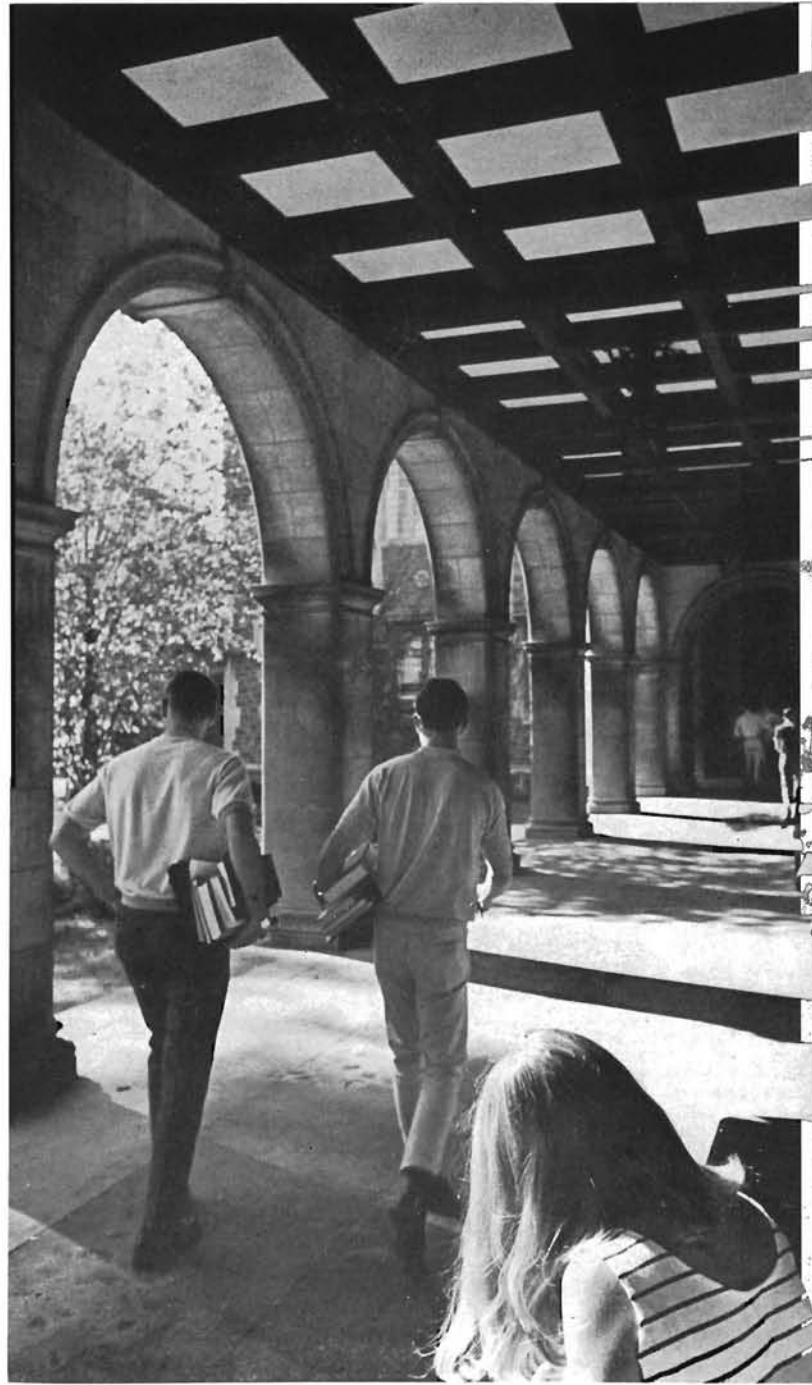
"One advantage in immunology is that you can choose the 'sperm' or the 'oxygen molecule' to carry out the interaction. We can choose almost any material off the shelf and have it serve as an antigen and observe how an animal makes a corresponding antibody. Together with recent advances, this is an important factor in why immunology now has a much broader appeal to biologists. In this respect, there isn't another situation in biology quite like it."



Brookings Quadrangle is the focal point. Flanked by a graceful arcade, it is at once classroom, meeting spot, place of meditation, and a grassy tapestry for the mid-morning sun to play patterns across.

The Washington University campus has the quality of surprise. Located in the bustling Greater St. Louis area, the campus breathes an atmosphere of almost sylvan peace and isolation. Insulated from the surrounding metropolis by Forest Park on one side and quiet residential areas on the other, it abounds in ancient trees, rolling lawns, and mellow stone buildings. In this photo essay, Photographer Herb Weitman has attempted to capture something of the special atmosphere of the "beautiful campus."

THE BEAUTIFUL CAMPUS





Beauty is not just a scene, but perhaps the sheer joy of having wheels on a warm afternoon when others must walk . . .

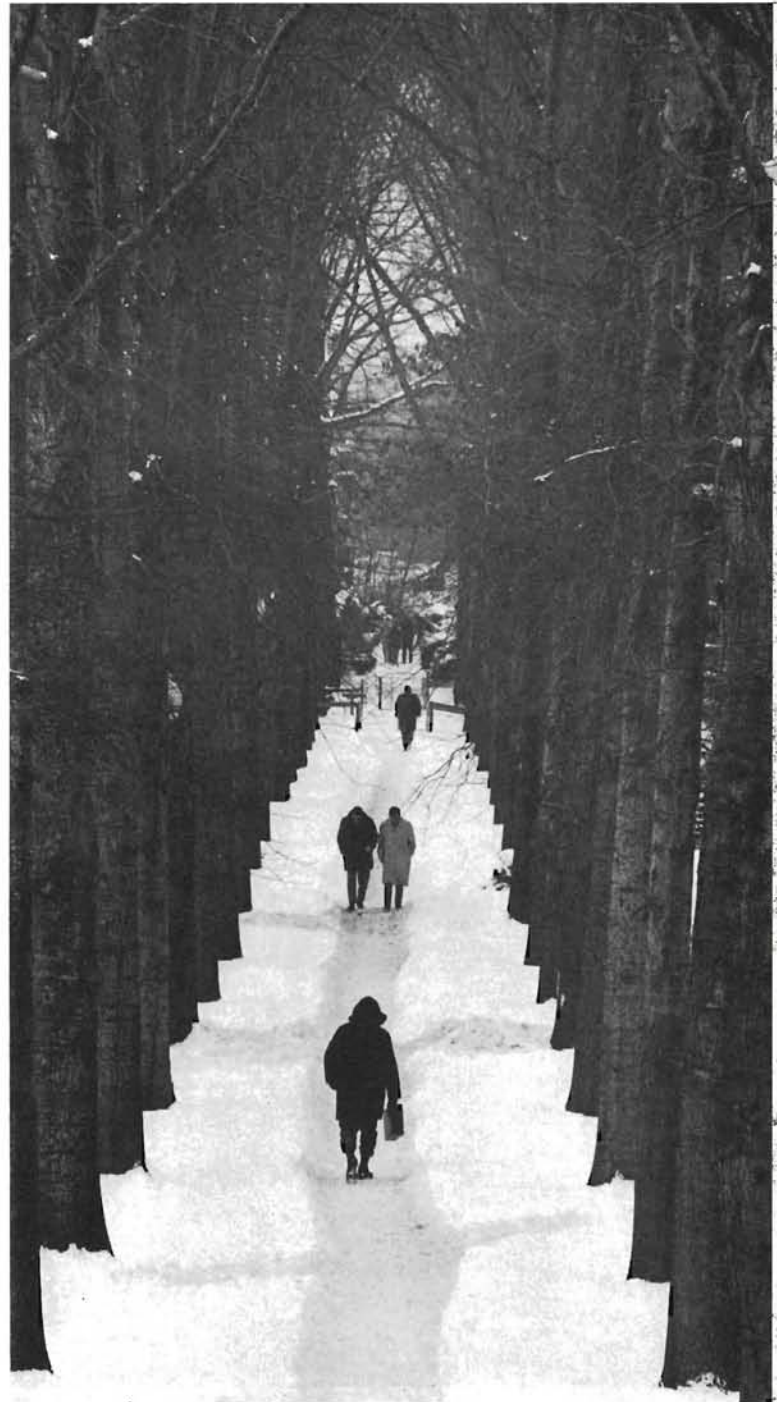


. . . or the ability to appreciate the lacework formed by sunlight through the ginkgo leaves.

The Beautiful Campus



It can be solitude. Solitude in which to study, or daydream, or even to prod an inquisitive ant with a ballpoint pen.



Silence is a part of the beautiful campus. And what is more pleasing than the silence of a shroud of new-fallen snow?



Companionship is a beautiful thing. The sharing of things learned and problems to be solved is a vital form of companionship at the University.



Flying wingtip-to-wingtip through a place where food abounds is a form of glorious companionship known only to campus pigeons.

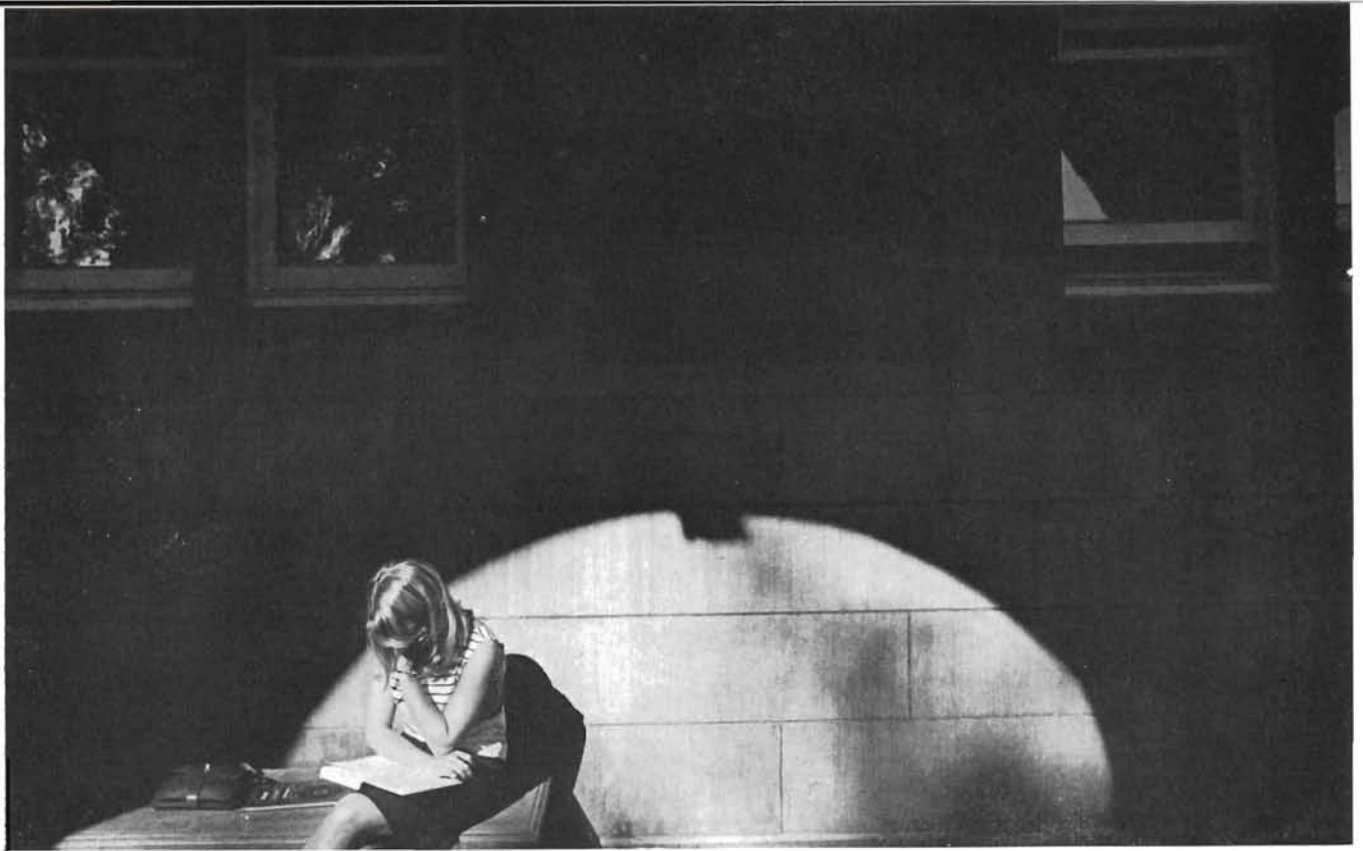
The Beautiful Campus



In the autumn, nature hangs her own theatrical scrim and the fog transforms familiar routes into paths of grey-golden adventure. Such paths are never long enough.



In the spring, familiar routines are forsaken as new friendships lead to new destinations. Many such springtime friendships become permanent; few are ever forgotten.



On the campus, beauty is found in large dollops and small dabs. A lone girl studying in a circle of sunlight is unaware of the picture she creates.



A brief snatch of excitement from a fall evening's football game. If he had caught the pass, it would have been really beautiful.



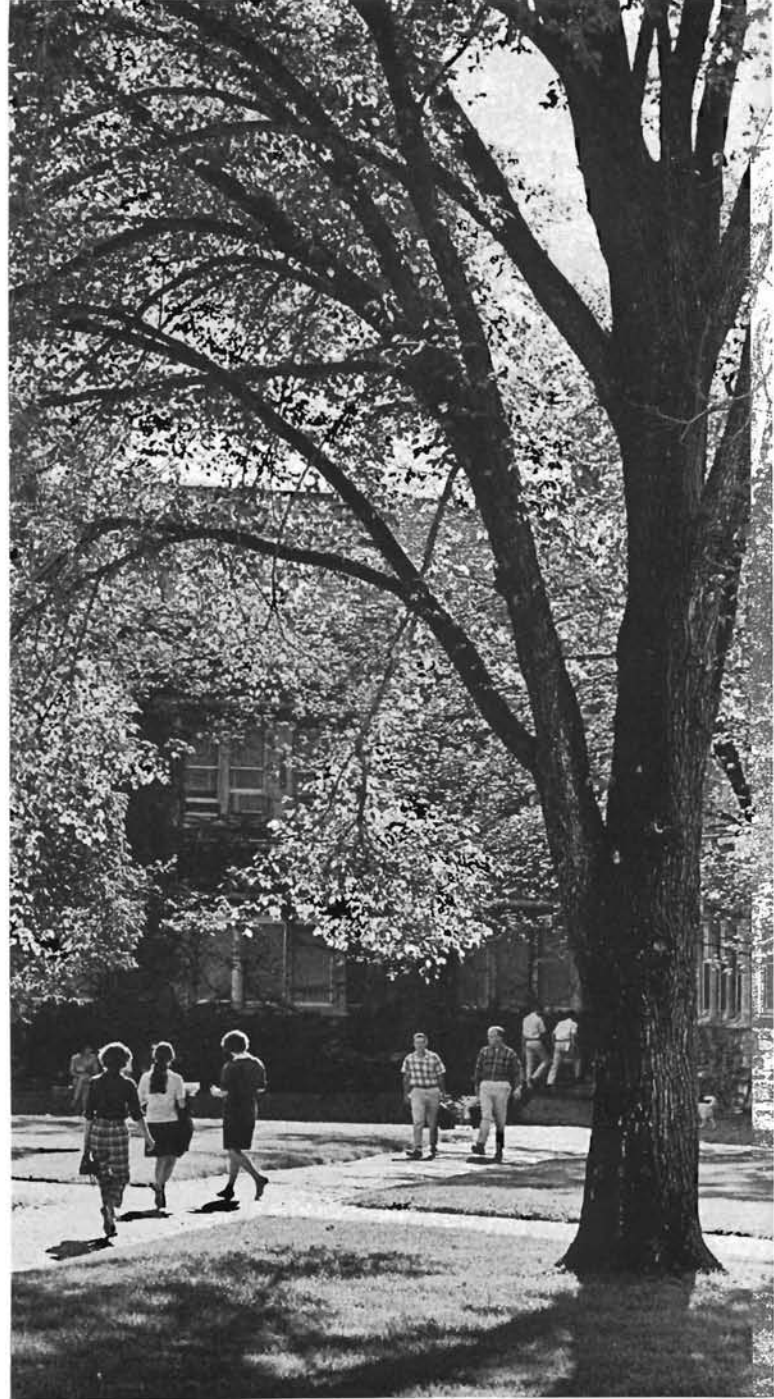
Not all beauty on the campus is produced by nature.
Man-made beauty has its own moments,
although it sometimes takes longer to understand.



Trees and buildings cannot alone make a university
a place of beauty. The people who inhabit the campus
do their part by just being there.



Joyce Kilmer has said it all. Trees are the accent marks on the beautiful campus. They are walls when they are needed. They support learning.



The trees are everywhere on the beautiful campus. They provide a living, ever-changing background for the campus scene.

The Beautiful Campus



Trees wait patiently to be noticed and appreciated while scholars notice only the problem being discussed. This is a beautiful aspect of trees. They rarely intrude.



A book, magazine, or letter from home can sometimes become only a scrawl of meaningless lines. It's handy to have a tree to look up to at times like this.



Nature does her bit also by clothing the trees in bright green buds and accenting the soaring lines of a new building.

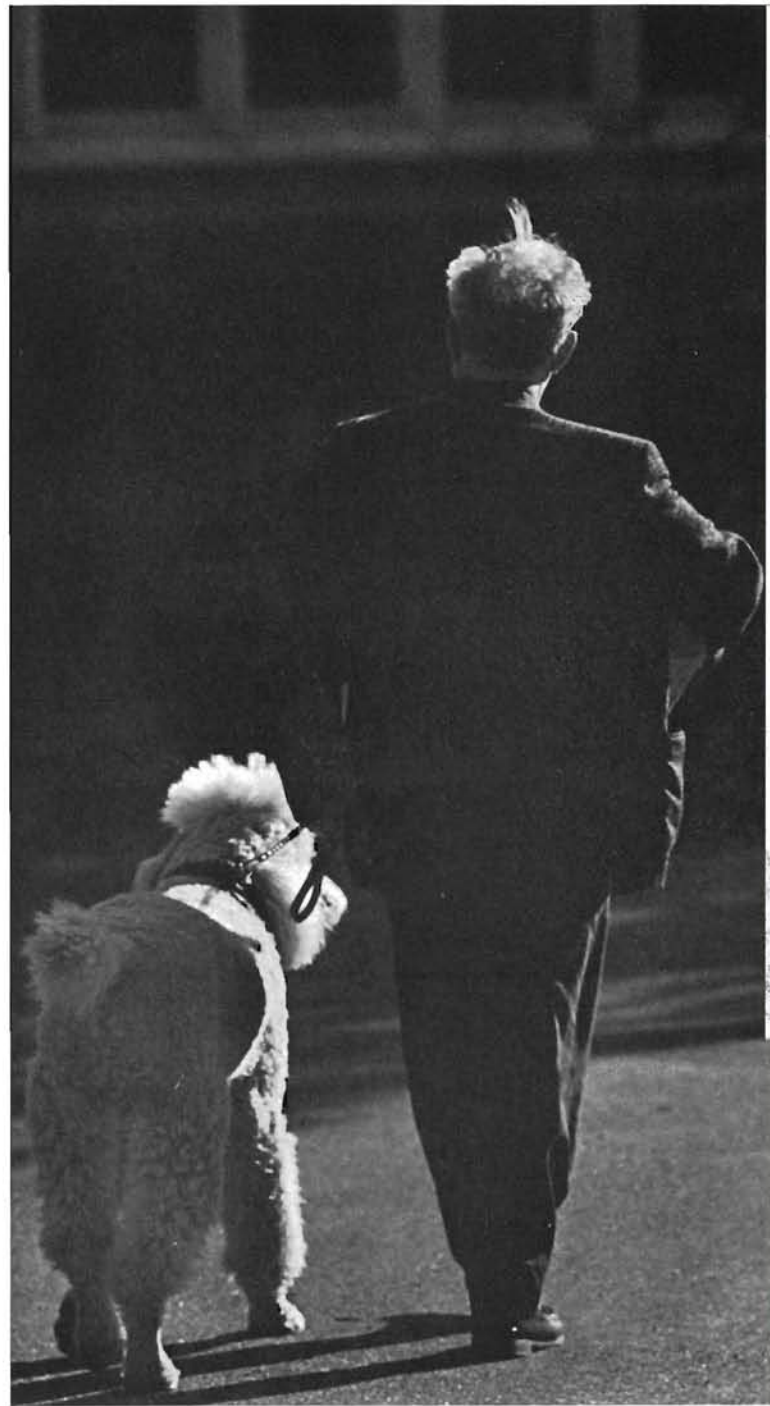


Caught between classes, few appreciate the qualities of rain. But who can imagine the beauty to be found in a dry umbrella?

The Beautiful Campus



The University is a place of endless conversation. When the buds burst and the sun grows warmer, the conversation moves outdoors and seems to become more meaningful.



Friends, dog and master, confiders of secrets: they have a beautiful relationship and share the same problem: How do you keep your hair in place on a windy summer afternoon?

A leading scientist-statesman, Dr. Killian is a member of the Board of Trustees of Washington University. He is presently chairman of the corporation of the Massachusetts Institute of Technology, where he served as president for ten years. During the Eisenhower administration, he was the President's special assistant for science and technology, and served as chairman of the President's Science Advisory Committee. In this article, a condensation of his William C. Ferguson Memorial Address at Washington University this fall, Dr. Killian adds a profound and provocative postscript to Sir Eric Ashby's observations of a decade ago on technology and the modern world



TECHNOLOGY AND THE ACADEMICS: A POSTSCRIPT

ABOUT A DECADE AGO, Sir Eric Ashby, a British scholar, published under the title *Technology and the Academics* a penetrating essay on the impact of the scientific revolution on universities in Britain, on how they slowly embraced science after this revolution had originated outside the university. In the course of his review, he examined a variety of interrelated topics: the role of technology as the cement between science and humanism; the importance of apprehending a technology in terms of its humanism as well as its techniques; and the proper way for the university to manage its changing relationships to society. It is this last subject, especially as it relates to engineering and to the role of the educational institution in urban affairs, that I wish to discuss, in the form of a kind of postscript to Sir Eric's study. By relating my observations to his essay, I hope that some of his insights will illuminate my exposition and give it perspective.

In his essay, Ashby recognizes the growing engagement of the university with the contemporary problems of society, a change that has been quickening and which he views as a direct result of the scientific revolution. He notes in support of his argument that current international relations as well as domestic affairs are inescapably influenced by science and technology. And out of this dependency has arisen a new and symbiotic relationship between learning and affairs, between academe and the larger society that has posed difficult philosophical and organizational problems for the contemporary university. To which it presents an uncomfortable dilemma, the horns of which Ashby describes in this way:

"Around every senate table," he says—and he's speaking, of course, of the faculty senate of the British university—"sit men for whom the word 'university' stands for something unique and precious in European society: a leisurely and urbane attitude to scholarship, exemption from the obligation to use knowledge for practical ends, a sense of perspective which accompanies the broad horizon and the distant view, an opportunity to give undivided loyalty to the kingdom of the mind. At the same senate table sit men for whom the university is an institution with urgent and essential obligations to modern society; a place to which society entrusts its most intelligent young people and from which it expects to receive its most highly trained citizens; a place which society regards as the pacemaker for scientific research and technological progress. And so universities find themselves searching

for compromise. On the one hand, they cannot bring themselves to refuse the responsibility laid upon them by modern society, nor the large financial grants which accompany these responsibilities. On the other hand, they cling to their traditional organization and curricula in the hope that the values for which universities have stood since the middle ages may be preserved among the automatic factories and social planning and satellite-ridden stratosphere of the third millennium."

Even though it has recognized for a century its service role in our society, the American university today suffers from something of the same kind of split personality, aggravated in part by the criticism that it has failed to contribute as it might to alleviating the urban crisis. I shall examine certain critical aspects of our American form of this schizophrenia and suggest also some therapeutic measures, limiting myself mainly to science and technology. Like anyone who aspires to be a good therapist, I shall be concerned with causes as well as cures. I begin my case history with World War II.

IN THAT DARK PERIOD we saw the establishment under the direction of a number of academic institutions of a number of large special-purpose laboratories which established a pattern for a new and potent kind of intellectual institution in our society. These laboratories were created in each instance to work on complex and comprehensive systems problems—problems of rockets and radar and antisubmarine warfare and nuclear weapons—and they represented a new kind of organization in the academic environment. Each laboratory was invested with an urgent mission. Many were large, and all were distinguished by a multi-disciplinary character and a unitary outlook. For example, the Radiation Laboratory at M.I.T., which was the nation's principal center of research and development for radar devices and systems, employed some 4,000 people and counted among its professional staff not only physicists, mathematicians, chemists, and engineers, but even a few biologists, architects, and social scientists.

The Applied Physics Laboratory at Johns Hopkins and the University of California's Los Alamos Laboratory were two other examples. There were similar laboratories, of differing size and with different missions, under the aegis of universities and institutes of technology across the country. And as one reads the records of their accomplishment, and the history of subsequent events, it

is clear that these laboratories with their close-knit teams proved beyond all doubt the power and potential of massive, interdisciplinary, unitary attacks on large and complex technological problems. They also may have shown how their presence in the orbit of a university may help it serve society by engaging in action-oriented research.

Certain industrial laboratories, notably the Bell Telephone Laboratories and the laboratories of the National Advisory Committee for Aeronautics, had earlier demonstrated the exceptional power of mission-oriented institutions to generate great advances in technology, but these great laboratories of World War II, as well as a number of postwar laboratories formed in their image, as, for example, the M.I.T. Instrumentation and Lincoln Laboratories and Caltech's Jet Propulsion Laboratory, dramatically established their exceptional capability to meet urgent national technological goals.

The salient point is that when universities were called upon to undertake large technological missions and action-oriented tasks, they invented new organizational arrangements to handle them. Only rarely could they successfully handle such missions within their central conventional structure. As many have pointed out, the university seems to function best when it is discipline-oriented and organized and, in fact, when it is not too tightly organized; and it is likely to violate its traditions and compromise its effectiveness if it subordinates the disciplines in favor of a unitary organization.

Nevertheless, the example of the mission-oriented national laboratory along with the growth of new scholarly interests not easily confined to any conventional discipline has encouraged new organizational experiments within the central structure of our universities. The last two decades have witnessed the appearance of interdepartmental programs, centers, institutes, or laboratories and other interdisciplinary groupings and special-purpose programs. These associations represented at first merely natural alliances of scientists and engineers around certain cores of mutual problems in such broad fields as, for example, communications or materials or astronautics or molecular biology. They recognized primarily a variety of fundamental relationships in science and engineering, such as the relevance of communication theory to computation and controls or of the fruitful interplay between solid-state physics and the engineering of new materials. They also have recognized the need of achieving an effort of critical size. These new entities have not superseded the old disciplines but have provided their faculties and students an opportunity to converge on problems requiring a multiplicity of disciplines for solution. They have reflected the need for new syntheses of knowledge and new unities in learning.

Through such modifications in their internal structures,

universities and institutes of technology have sought to deal with new unities of learning and to relate themselves to the world of action. These rearrangements have been most successful in the domain of science and engineering, where it is relatively easy to build bridges between the disciplines and where the differences in language or style are not too great.

The question now confronting our institutions is whether these or other structural arrangements can give faculties and students an acceptable means for contributing helpfully and wisely to social and community needs. Let me stress at once out of personal experience the difficulties, hazards, and frustrations of engagement in community affairs. I have worked both in Washington and in my local community, and I found it easier to make a contribution in Washington.

THERE IS NO QUESTION about the desire of academic communities to assist more directly in meeting the problems of urban decay, poverty, and environmental deterioration. In recent months we have witnessed constellations of faculty and students being drawn together in numerous institutions by problems the components of which are social as well as technical. The academic personnel seeking to engage themselves in these collaborative efforts represent a wide range of disciplines—engineering, management, the social sciences, architecture, the humanities. They are moved by a deep commitment to increase the scholars' contribution to society for short-term as well as long-term service, and by a belief, so often but so truly asserted, that the modern university, with its free interchange of ideas and its capacity to mobilize a diversity of disciplines, is in a unique position to contribute to the deepest needs of our society and to facilitate political and economic action to meet these needs. But their enthusiasm and will to action is fortunately moderated by the realization that useful action may be dependent upon a deeper understanding of the problems than research and study have yet achieved. The university's contribution must not rest on superficial understanding.

There is the will, but where is the way? And can a way be devised that does not imperil the primary mission of the university and its central preoccupation with the student? My answer to both these questions is yes. This is a statement of faith, for I believe deeply that it must be yes, but we have not yet clearly found the way. So far universities have had only a minor role in the urban arena.

Our urban communities are indeed plagued today by the absence of organizations and techniques competent to deal with complicated systems. Political and organizational reforms are the priority need, but is it possible to devise the technological means, the systems analyses and



the information transfer that will meaningfully strengthen civil management? A number of scholars regard the development of information systems as the most critically needed tool for improving the planning and management of our urban environment. They see the need for urban information centers employing computers and capable of providing information feedback upon which decisions and planning can be based. Grave problems lie ahead, such as insuring the privacy of individuals, political acceptance, and the possibility that beautifully complex data systems may not always be compatible with social issues; still these problems won't be solved without searching, systematic study on how to design and test such systems, and universities must lead in this effort.

Some opportunities are clear. Planners and managers need to draw useful information from the great and uncoordinated masses of urban data that so far have been largely impenetrable and consequently of little use. We need research and programs to reduce housing costs and above all we need more research and development focusing on the problems of education. The centers which have done so much for curriculum reform need counterparts or extensions to deal sensitively with ways in which the components of education can be related to the wholeness of the system. Other problems requiring the use of technical methods and resources include our transportation systems and the comprehensive control of pollution.

NEW KINDS OF institutions, both internal and external, may be necessary to permit the appropriate participation of university scholars in such systems efforts and short-range goals without weakening the central function of the university to teach and to conduct basic research, and without breaking down the insulation that enables it to serve the long-range needs of society.

We must be equally inventive in protecting the university community in another way. As nearly as possible, the university should be a community of scholars who are clearly free from serious conflicts of interest. This is not to say that conflicts of interest do not exist in the academic domain. They do, but no other environment has the opportunity and is expected by society to be so free as the university environment. It is of the greatest importance that the universities protect this freedom and objectivity and that they not compromise it by entering into any kind of relationship or social action, whether it be with industry, government, or society generally, that makes it difficult for their faculties to be independent in judgment and unfettered in scholarship. This will not be easy, but we should never forget that a great body of scholars—uncommitted, independent, and scrupulously objective—is the best insurance that scholarship will have unimpeachable integrity and that there will be no abuses of the

profound public responsibilities scholars are increasingly called upon to assume.

I have suggested the possibility of adapting some of our new intellectual instruments outside the university to the attack on the great public and civil problems of our time. Others, too, have made this suggestion and have urged such a role particularly for the not-for-profit organizations, like Mitre, the Rand Corporation, and the Institute for Defense Analyses, that have been formed in some abundance over the past two decades to serve the government. These new corporations, or "think tanks," as they have been called, have been effective in conducting analyses of paramount importance to the development of military weapons and strategy and to certain aspects of international affairs. They have also served our universities well by relieving them of certain kinds of intellectual tasks, notably in the domain of national security, that universities would find it inappropriate to undertake directly.

The Rand Corporation, for example, is exploring with the City of New York work that might be undertaken on its complex transportation problems and on such other broad problems as pollution, health, and housing. Rand's work for New York would be a comprehensive and cohesive effort in contrast to the fragmented and piecemeal approach that has been typical of urban studies.

Another nonprofit group, the Mitre Corporation, which does electronic systems engineering for the Air Force, has also conducted such nonmilitary research as studies of air traffic control for the Federal Aviation Agency.

The Institute for Defense Analyses is still another that has increased on an important though modest scale its programs of research and analysis in the area of public problems. For example, it also prepared an important report, parts of which received widespread attention in the press earlier this month, for the President's Commission on Law Enforcement and Administration of Justice. This study was a comprehensive review of the relation of science and technology to the whole criminal-justice system, and it included besides police operations, such facets of that system as various aspects of court management, corrections, and crime prevention.

These few examples are sufficient to substantiate the point that the not-for-profit corporations, organized initially for purposes of national defense, may find it appropriate to include in their agenda analyses in the domain of urban and public affairs. It is my judgment that our society will have a growing need for the Mitre-IDA-Rand type of organization and that such organizations will become permanent features of our intellectual landscape.

But even with reasonable increases in the involvement of the nonprofits in urban and civil affairs, there will be hard limits on what they can undertake, and they will not be surrogates for the universities in these areas nor

match their capabilities. If their vitality is to be sustained, they will require some kind of informal relationship with university communities which will enable them to partake of the regenerative forces of the university. In turn, they might serve the universities well, not only by relieving them of projects inappropriate for universities, but by offering the universities an opportunity to share in large-team studies, and by providing special study and research opportunities to graduate students and post-doctoral fellows. This kind of involvement in advanced education is important; the multiplication of intellectual institutions that make no contribution to the nurturing of new talent is not, in my judgment, in the long-term interests of our society.

ALVIN WEINBERG has suggested that another approach might be to establish, on the pattern of the existing national laboratories, new national socio-technical institutions. Such institutions, with high capabilities in the social sciences as well as in technical fields, could be organized from the outset around a new and identifiable domain of interest. It may well be worth a try to establish one or more national laboratories devoted to the application of technology to urban use.

Still another possible arrangement, and perhaps a better one, would be the establishment of socio-technical institutes attached to some of our major universities in an adjunct relationship or managed by groups of universities. Existing laboratories like Brookhaven, Argonne, Lincoln, or the Jet Propulsion Laboratory provide models of a kind. An example of such a socio-technical institute might be one devoted to the application of technology to community health problems.

In any event, it is likely that we will need a variety of new institutions, both to give a new dimension to the socio-technical studies of the university and to launch a truly effective attack on our most pressing community and national problems. These problems are all of such a scope and magnitude and complexity that no single sector of our society can handle them alone. Not only do I foresee the need for new institutions and innovative institutional arrangements, but I am sanguine about our ability to invent and construct them.

We are witnessing, for example, the emergence of inter-institutional arrangements for the use of computers and for other large machines, and have seen such innovative institutions as the Educational Services, Inc.—now merged with Educational Development Corporation—provide rallying points for scholars and teachers to develop new curricula for the schools and new materials and methods for teacher training.

We need new internal arrangements also to deal more effectively in our universities with the problems in urban affairs I have discussed. This is not to say that we have

not achieved in a number of universities useful interdisciplinary efforts. But these are focused for the most part on sub-systems. There is need, as I have emphasized, to understand the urban system as a whole, and in studying this system, university communities will need to devise an integrating arrangement of scholars and disciplines that might be called an Urban Systems Laboratory.

We need to strengthen further those interdisciplinary efforts in which we are already making progress. In advancing community health, for example, we need a total community approach. There is an unrealized potential in computer technology to achieve a better analysis of health data, to process patient data, to experiment with computer-aided diagnoses, and to make medical information more readily available—all of this designed to free the physician to be more effective with the individual patient and to reduce the rapid rise in the cost of medical care.

The physician in the medical school and hospital more and more needs help from the scientist and engineer. The field of bioengineering is an example. There is a large family of goals such as the artificial or assisted heart, the artificial kidney, and advanced prosthetics, where the physician, the scientist, and the engineer must join forces. Participation of engineers from industry as well as from universities is important in these undertakings. As Dr. W. O. Baker of the Bell Telephone Laboratories recently pointed out, the pure scientists and the engineers with an interest in such fields as electronics have developed a subculture which permits a common language, an easy intellectual exchange, and a joint attack on problems. At present there is little such subculture to facilitate full intellectual cooperation between engineers and physicians.

I know that this is a subject of intense interest at Washington University, and the constituent fields are ones in which the University has traditionally had great strength. We have a similar interest in Cambridge, and we have begun a novel approach to the problem with the establishment this fall, under the joint aegis of Harvard and M.I.T., of a Liaison Committee on Engineering and Living Systems. A major purpose of this cooperative venture is "to draw upon and relate the vast store of information and facilities in the physical and engineering sciences and mathematics and the extensive resources in the areas of medicine and biology." Specific collaborative efforts to be undertaken through this arrangement will focus on such objectives as the development of new machines to save the life or preserve the health of a patient and the application of newer technology to the improvement of medical care.

These observations about the role of the university in public affairs bring me now to the widening mission of the engineer. He has special insights on organizing scholarly resources for the public welfare. His professional responsibility has never been so central to our



society as it is today. I refer primarily to the engineer who, in Ashby's phrase, "views technology as inseparable from men and communities." I refer to the engineer who has achieved a mastery of his specialty, but who in addition has the capacity and motivation to use and shape technology as a powerful instrument for enhancing the quality of our society as well as its material advance, and for helping to solve the social problems of our time. Hardly any other kind of professional man today occupies a position of such socially strategic responsibility and opportunity for critically important public service as the engineer. Occupying as he does a unique vantage point for harnessing science for the benign service of society, he is desperately needed to lead us in coping with the most urgent problems of our time.

More and more gifted and sensitive engineers are rising to accept this urgent responsibility, but the demand is greater than the supply. The great destiny of engineers in our time is to inform the people out of their special knowledge of how technology can glorify man and to help the people to resist those who insensitively use technology in ways hurtful to the spirit.

We must, of course, recognize the importance of those engineers—the great specialists—who limit themselves to dedicated, creative technical work, and we honor them no less by stressing the need for engineers who accept the more comprehensive responsibility.

INDEED, OUR ENGINEERING schools must play a major role in giving engineering this genuinely professional orientation and in preparing engineers in sufficient numbers who have the breadth of view and of skills and the broader social orientation to fill this gap in our professional resources. One of my colleagues, Professor Jay Forrester, has spoken of this urgently needed new engineer as an "enterprise engineer" or a "socio-technical systems engineer," and he believes that a "tenfold increase in the yield of enterprise-engineer calibre of men calls for an entirely different kind of educational institution . . . that focuses on the gap in the upper elite sector of engineering practice."

Both the schools and the engineering profession itself must turn their attention toward creating the engineer who can provide the kind of professional leadership I have sought to describe. I call for a major effort in our schools and in our professional societies to build the context out of which this kind of engineer can emerge.

Against the background of this review let me now order my conclusions as follows:

- 1) Technology, which is the application of science to the needs of man and society, is essential for the solution of such urgent civil problems as the improvement of the urban environment, but it must work in concert with the social sciences, the arts,

and the humanities, if benign solutions are to be found. In modern society, as Ashby maintains, "technology is inseparable from humanism."

- 2) Universities must cultivate new modes of thought and new forms of organization if they are to bring the wholeness of technology effectively to bear on the peacetime needs of our society. Ashby spoke prophetically when he said that "technology could become the agent for assimilating the functions of the university into the new age." The discipline-oriented university structure must be retained, but it must be supplemented within and without by diverse organizational arrangements which facilitate multidisciplinary groupings.
- 3) While the universities have shown a high degree of adaptation in dealing with what Ashby terms the wholeness of technology, there is a limit to what they can do and still keep unimpaired their primary mission to teach. Those characteristics of the university which give it its uniqueness—the capacity to nurture talent and the maintenance of an environment benign to the play of individual genius and to unfettered inquiry—these qualities must be protected at all costs, and in order to do so, the university will need to seek experimental relationships with a variety of external organizational arrangements—not-for-profit corporations, national research laboratories, new socio-technical institutes, bioengineering or community health centers, and other such arrangements. Some of these may be quite independent of the universities and designed to undertake missions not appropriately or well handled by universities. Others should be avowedly adjuncts to universities, others managed by consortia of universities. This complex of institutions, however, should strive for a cordial interplay so that together, while each maintains its own identity and style, they may contribute to the solution of the great civil problems of our time, undertaking tasks which neither can do well alone. The mission-oriented laboratory or project, whether within or without the university, can strengthen the education of engineers by providing them with the equivalent of the "teaching hospital" in medical education.
- 4) As never before, our society must look to the engineer and the institutions which educate him to provide leadership in putting technology to beneficent and aesthetic use. The high mission of the engineer today is not only to create new technology and to put it to work but to lead in making technology the servant of man's highest aspirations and of our society's total welfare.



Richard Palmer, acting chairman of the Performing Arts Area (right).

The performing arts are experiencing a renaissance at Washington University. Grouped together in a new "area," drama, dance, and the Opera Studio are staging exciting productions—some of which are playing to SRO. This rejuvenation has created fresh excitement and stimulus on the campus, and rekindled the hope that an adequate theatre will be built to house the performers who are bringing new sparkle and dash to the University stage.



Dennis Sheppard, a graduate student, and Jane Kelsey (foreground) in an Opera Studio production of the "Coronation of Poppea."



Opera Studio singers Carolee Coombs and Gerald Cozart (foreground) join with guest singers Alex Gray and Joe Sopher in the "Barber of Seville."

THE MUSES ARE HEARD

SOME YEARS AGO in an abrupt about-face, novelist Truman Capote pulled an unusual switch and instead of creating a story decided to cover one. For his first task as a reporter, the New Orleans-born spinner of tales chose to chronicle the tour of an American "Porgy and Bess" company of the Soviet Union.

He called his story of this adventure "The Muses Are Heard" and it is precisely the title we decided would best fit this piece which is a report of how some of these mythical goddesses, long dormant at Washington University, have become as vocal as a Greek chorus.

All of which is to imply that while not *all* the Muses have been exactly silent at Washington University in recent years—some have been in particularly good voice—there are at least a few for whom Zeus and his spouse Hera must have wept because their lot was not a happy one. The times were especially out of joint for Melpomene and Thalia, the Muses of tragedy and comedy, and for Terpsichore, identified with the dance.

From time to time they were heard from—but not enough people listened—until finally about four and a half years ago drama at Washington University was all but dead. Dance, thanks to the stubborn determination of a wisp of a German emigrant with a disarming smile and an iron will, Annelise Mertz, its director, was a bit better off—but not much.

The University's Opera Studio, supported by a strong music department, was thriving, particularly in terms of singers, but each season its director, Harold Blumenfeld, had to face anew the task of finding a designer and people able to operate the scenic machinery.

Such was the state of affairs when Dr. Richard Palmer, a tall, vigorous English professor, arrived on campus in 1964. Palmer is a mild-mannered, rather scholarly chap

who also happens to be a man committed to a cause—and that cause is the fostering of the theatrical arts on the Washington University campus.

Those who have watched him quietly go about the task of rebuilding drama at Washington University and wedding it to its sister arts give him much of the credit for the creation of what is now called the Performing Arts Area. "I would say that Palmer has been the catalyst," is the way one colleague put it, and his opinion was echoed by others who have watched him doggedly go about the task of organizing a new program at the university. "I remember," Palmer recalled, "that the first meeting I attended when I got here was for the purpose of abolishing Thyrsus. Things had gotten so totally bad that it just seemed as if that were the only recourse." That Thyrsus, one of the oldest dramatic organizations of its kind west of the Mississippi, should have been about to disappear may sound a bit melodramatic, but the student dramatic club which nurtured such names as Fanny Hurst, Morris Carnovsky, Melville Burke, Marvin Miller, and Mary Wickes was in a precarious position.

THERE IS NO easy or ready explanation of why the theatre at Washington University should have fallen into such a state of decline. "My own belief," Herbert Metz, assistant professor in the Performing Arts Area, declared candidly, "is that suddenly we've come out from under the rock and are looked upon as a respectable discipline. We've been given a kind of official recognition by the administration, and now at long last people have ceased to look on the youngsters who are interested in the theatre as sort of freakish kids and have accepted them as members of the community in good standing."

"For too long," he continued, "we were thought of as

sort of an extra little bauble to be tolerated. I'm terribly surprised that this Performing Arts Area was created and began functioning this fall, for the general attitude for a very long time was that we were sort of playing. You know, like kids of eight saying 'let's go out and put on a show in the backyard.' There was no realization of the enormous amount of work required to stage a production. I put in 128 hours on 'Oedipus Rex'; 113 went into 'Cocktail Party.' Now, people are beginning to realize this and to understand that when we go into rehearsal we're going into a kind of convent."

One proof that there is a new understanding of the place of theatre at the University is indicated by the fact that professors who are directing shows are now being given a course cut to help them carry the enormous burden of a classroom schedule and performances. This is *de rigueur* at other universities, but it is a newly established policy at Washington University. Also, for the first time Washington University has a technical director, David Jager, to stage its productions.

OTHER CHANCES MAY COME. There is agitation, for example, to give the students credit for the hours of rehearsal they put in when preparing for a major performance. "Their work is not easy," Herb Metz emphasized. "It's hard work, frustrating work—I've seen the girls go off and cry and the boys get very angry. These kids give us four hours a day including Saturdays and Sundays for a month or more—that's much more difficult than doing three term papers, yet right now they get nothing for it."

Tim Wolfe, a junior in the College of Arts and Sciences, who usually winds up with a lead in the Performing Arts productions (he was Macheath in "Threepenny Opera" and Sidney Brustein in "The Sign in Sidney Brustein's Window") was adamant about this point. "Now that the Performing Arts Area has been created," he declared, "I think theatre work is co-curricular, as opposed to extracurricular."

This is one of the problems that will have to be faced as the Performing Arts Area becomes more deeply rooted on the campus. That it will be met and solved in due time is a foregone conclusion, however, for the Performing Arts people are a cheerfully stubborn group who behave as if they believe that nothing is insurmountable. This is not to suggest that they are a bunch of Pollyannas content to suffer gladly, but that they are, instead, a group of pragmatists accustomed to dealing with obstacles as they arise. In terms of *real politick*—they have developed a *modus operandi*, or expressed in current campus vernacular, "they have kept their cool."

It was precisely this point which Dr. Palmer made one autumn afternoon as he sat in the utilitarian offices which are the Performing Arts Area quarters in Duncker Hall and ruminated about how it came to be and where it is going. "We designed a program," he emphasized. "It's not the ideal program, but it's the kind of academic program that we could offer with the staff that we have. Actually, it's amazing how many courses Washington University was offering in drama, but they were divided among the various departments. German had courses in the theatre of the absurd; French had its own offerings

and so on, but the unfortunate thing was that they were scattered all over. What we did was to collect all of these courses together in order to offer a major in drama—the first time, incidentally, that such a major has been offered in the history of this University.

"This is very exciting," he continued, "because in drawing on such resources we didn't have simply a small clique of people interested in the theatre, but people from different departments, each with his or her own point of view. What we have come up with," he continued, "is a good program. In many ways," he added, "for an undergraduate program it's among the best in the country. This may seem contradictory because it's so new, but in the more academically oriented fields such as dramatic literature we have as wide a variety of courses with as high a quality of teachers as you'll find anywhere in the country."

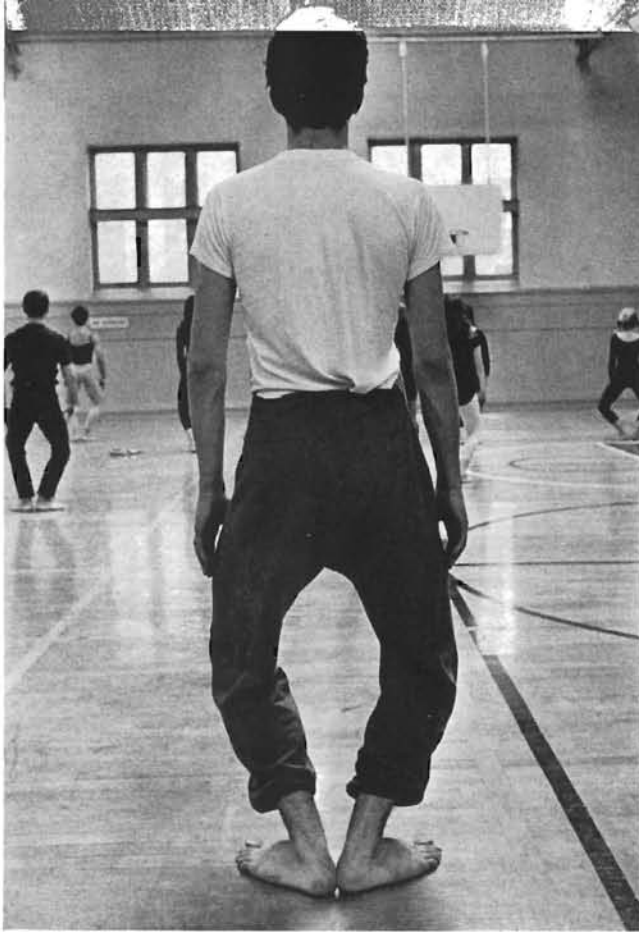
That the Performing Arts Area, which began functioning as a unit only last fall, should already be such a thriving, yeasty entity on campus surprises even some who helped create it. But, it was built and staffed by eager, energetic men and women, and they are people with a purpose who are in a hurry.

One doesn't have to be super-sensitive or blessed with "ESP" to sense this attitude. Indeed, the Performing Arts Area headquarters seems charged with it. To catch a professor for an interview—one virtually has to grab him by the coattails—for the teachers operate on taut schedules, and the general atmosphere is one of "Let's get on with it, for there's much to be done."

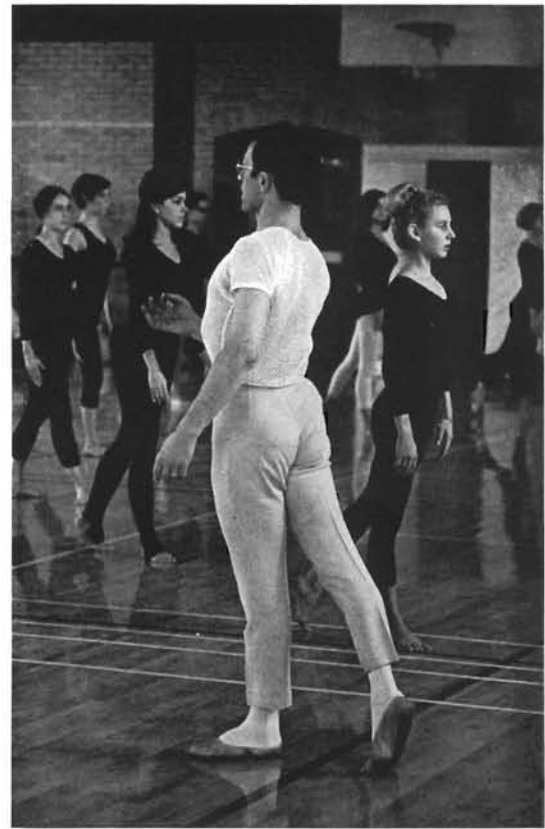
PALMER, HIMSELF, is a case in point. He had been on the campus all of two weeks when he fired off a seven-page proposal for an educational theatre which had such an impact that it eventually led to the establishment of a special council chaired by Professor Egon Schwarz to consider the whole question of the performing arts on the campus of Washington University. Appointed by Dr. Robert Palmer, who was then dean of the faculty of arts and sciences, this group, known unofficially as the Schwarz committee, came up with a series of recommendations in June of 1966 which led to the establishment of the Performing Arts Area, with Dr. Richard Palmer as acting chairman.

To Dr. Schwarz's group, Dr. Merle Kling, now dean of the faculty of arts and sciences, pays great tribute: "I think that a lot of credit ought to be given to the committee chaired by Professor Schwarz because the report that it drew up pointed both in the direction of long-range development and called also for a more modest immediate development. This emphasis on dual objectives was constructive. Because the report did have these two levels, it enabled us to do something at once. If the report had pointed only to a grandiose development we might have been paralyzed while we waited for a miracle."

What Schwarz and his colleagues recommended was that drama and the degree program of dance be transferred out of the English and physical education programs and be allowed to function under the collective and protective umbrella of the Performing Arts Area. Eventually, the Opera Studio was also included, although it



A beginner warms up in a master's dance class conducted on campus by guest artist Murray Louis.



Daniel Nagrin, a guest artist from New York, demonstrates a step to another master's dance class.



Lithe dancers move across the floor with graceful freedom in response to directions from Murray Louis who frequently comes to St. Louis from Manhattan.



In an improvisational theatre class, sophomore Marsha McGowan pretends that she is walking through bubble gum. It sounds easy, but it requires imagination.



Students in the same improvisational theatre class sculp a ladder out of air. This exercise in mime is one of many devised by Sidney Friedman, assistant professor.

still maintains its close ties with the music department.

These recommendations were adopted unanimously by the faculty with the result that the Performing Arts Area officially offered sixteen courses this fall to the student body. The response has been overwhelming. Enrollment in some courses doubled.

Multiple sections have had to be instituted to take care of the overflow. "In terms of numbers," Dr. Palmer explained, "it may not sound like much compared with those in physics or history, for example. But I have thirty in my sophomore classes compared with fourteen last year, and these thirty represent some of the most talented kids I've ever encountered in the classroom. We've really got some tremendously exciting students on this campus."

The crucial question that Palmer and his colleagues have had to face in drawing up a program for these students is in what direction they wanted to move. Should the Performing Arts Area be geared towards the eventual development of a conservatory turning out professional performers or should it be strictly amateur-structured in its emphasis?

What was involved here was a need to define the basic philosophy and direction of the Performing Arts Area, and both students and faculty recognized this fact. "My own feeling," Dr. Palmer explained carefully, "was that the University is essentially an educational institution so consequently it should be concerned not with either professional or amateur theatre but with something in between which is educational theatre. That's an unfortunate term and we use it only for want of a better term, but it is essentially what we're aiming at, I believe. It's amateur in the sense that we're not commercially oriented and yet it's professional in that we aim for professional standards in the performance."

PERHAPS SIDNEY FRIEDMAN, assistant professor in the Performing Arts Area, put it best when he said, "This is a program that has not been specifically designed to serve a given function. It is an undergraduate major within the realm of a liberal arts program."

Their aim is to develop not only artists, who with additional training can become first-rate performers or teachers, but to give students an opportunity to become involved who have no vocational or avocational interest in the arts of the stage. "We want," Dr. Palmer stressed, to create good audiences. Fifty percent of the average commercial audience for the performing arts today have had graduate training," he added. "If the arts are to survive and flourish in this country they will survive because of this educated audience that we're developing for them. Today's students will become tomorrow's audience. It's so important that we let them know what good theatre is so that they won't be happy with 'Where's Charlie' or some second-rate Broadway commercial production."

That students generally approve of the direction in which the Performing Arts Area is moving was made clear by Tim Wolfe who said: "There are a lot of actors

who are really sort of poseurs rather than artists because all they know is theatre. Here, in addition, to acting or dance, or whatever, we take many other subjects such as western civilization or physics or sociology. And that's the way it should be, I think, because an artist should have some sort of feeling or consciousness of the world around him—its past and present."

One of the reasons that Wolfe and others like him elected to stay at Washington University rather than to transfer to a larger university with a Gargantuan drama department is because here on campus they get a chance to act. "It's ludicrous," Wolfe insisted, "for anyone to think that you can teach acting. You can't put a list of things in front of students and have them learn them as in an anatomy class. There's that element of inspiration involved that you just can't communicate. You can work with it, and you can discover and help develop it, but you can't really teach it. That's why here, where I'm getting a chance to act, I believe I'm getting far more out of the Performing Arts Area program than I would if I were part of a larger department at a much bigger school."

THERE IS LITTLE DOUBT, then, that the Performing Arts Area at Washington University is on the move, and that it is moving in the right direction, but right now, when it presents a production, it has no place to go but Brown Hall. And Brown Hall, for many reasons, is abominably unsuitable. In a recent review of a performance by Daniel Nagrin, an outstanding dancer brought to campus through the energies of Miss Mertz and the Dance Concert Society which she founded, the reviewer led off his comments with a sentence beginning, "In that most ridiculous of auditoriums, Brown Hall," and few would disagree with him.

That Nagrin appeared in Brown Hall is surprising. Other artists, including dancer Murray Louis, have been known to take one look at it, and then walk out in disgust. It is not only that it is musty, cramped, and ill-equipped—it is literally bursting at the seams. All the performing arts need it for rehearsal, and when more than one production is in rehearsal at a time chaos results.

In November with Kadadiz taking over the Brown stage for its "Once Upon a Mattress" production, the actors in "A Sign in Sidney Brustein's Window" had to squeeze themselves into the scene production studio on Millbrook in order to rehearse. That they were able to concentrate amidst the confusion of paint pots, half-finished flats, and the scurrying about of student carpenters is remarkable. But it is not atypical, for the whole Performing Arts Area operates in a kind of free-wheeling *gemütlich* atmosphere.

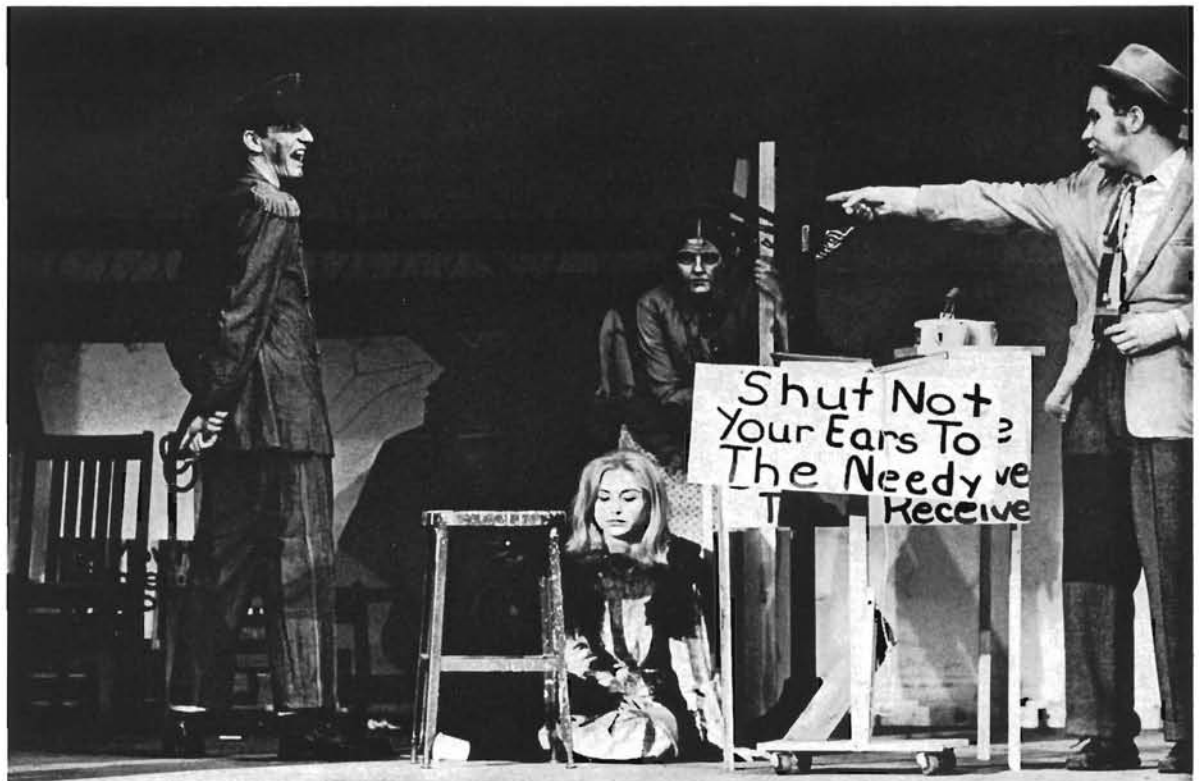
Annelise Mertz's dancers rehearse in sterile isolation way down in Wilson Studio to the accompaniment of the splashing swimmers in the pool next door. Harold Blumenfeld's opera singers practice in a great barn of a room in McMillan Hall. That is, some of them do. The rest are crowded into two rooms which he likens



Tim Wolfe, a junior, (left) starred as Macheath in "The Threepenny Opera." With him is Bob Shelli, a sophomore, who played "Bob the Saw."



Macheath's gang sings a wedding song in a barn in Soho. "The Threepenny Opera" is by Bertolt Brecht and Kurt Weill.



"Tiger Brown," the police commissioner in "The Threepenny Opera," admonishes the members of Peachum's beggars' organization not to picket the Queen's coronation.

to closets and the result, when rehearsals are in full swing, is comparable, he says, "to a three-ring circus."

Of the situation Blumenfeld says succinctly, "This is the only major university (public or private) in the whole country that doesn't have a theatre. We are all doomed to mark time until there is a theatre. It's not that we have an edifice complex here. It's just that we have so much to offer and no place to offer it. Really, it's an affront to talent such as we have to make them work under such grubby conditions. If the stage arts (that is, the performing arts) are ever to be unstraightjacketed at Washington University, then we have got to have a theatre on campus and one with abundant rehearsal space."

Such a center would do much to draw the arts closer together. Because they rehearse in widely separated places now, dancers and drama students and opera singers, while officially allied under the unifying Performing Arts Area, tend to view each other as strangers rather than fellow artists.

ON OCCASION THERE HAVE been attempts at collaboration. Professors Blumenfeld and Mertz co-directed Monteverdi's "Coronation of Poppea, for example, but these have been exceptions rather than the rule. Next semester, Sidney Friedman and Miss Mertz will give a joint course called voice and movement—but much more could be done if the performing arts had their own coordinated rehearsal facilities linked to a modern stage.

Perhaps no one feels the lack of modern facilities more keenly than Miss Mertz. Right now, she thinks because her dance studio is so far removed from Brown and McMillan, few actors or singers realize the importance of proper movement on the stage. "The creation of the Performing Arts Area is bringing a change," she believes. "For the first time drama students are beginning to understand that creative contemporary dance is something worthwhile to study if they are to handle their bodies properly on stage. Now some of them are so excited, they don't know whether to major in dance or drama. But this is only a beginning—we need practice studios in order to really begin to know and appreciate each other's disciplines.

"Dance," the petite, dynamic teacher emphasized, "is much more than just an exercise for pretty girls who want to learn how to be graceful and lose a few pounds. It is a serious, strenuous art that requires inner discipline."

Similarly, a need exists for closer rapport between Harold Blumenfeld's Opera Studio singers and the other students in the performing arts. As a whole the members of his group are slightly older than those in drama or dance. His singers are equally divided between good voice majors from all across the land, and professional singers from the community who register through University College because they want the experience that only his organization can provide. Despite the handicaps under which he operates—on top of inadequate rehearsal facilities, he expects to stage his operas this spring with-

out an orchestra because of a budgetary bind—Blumenfeld's Opera Studio is considered one of the top ten in the whole country.

It is good because it is innovative, alive, and vibrant. And that is one of the very real strengths of the entire Performing Arts Area at Washington University. It can afford to experiment—to do the things that are considered too avant-garde for conventional companies. Of the Metropolitan Opera, Blumenfeld says candidly, "There they do six or seven operas each season, and they do them year after year. All of them are at least seventy-five years old. Most of them are like Franco-Italian salami. They've been predigested 2000 times. Everybody knows them, you can't kill them. You do them with bigger and bigger voices and poorer and poorer stage direction, and sillier and sillier settings. This is not what I think opera is.

"Opera's a vital art. It's not by any means in a dying spasm. Marvelous operas are being composed today. We try in the Studio to do scenes from them—sometimes we do entire operas of this type. This spring, the Opera Studio will stage the world premiere of Marc Bucci's "The Hero," and we've scheduled the Midwestern premiere of Stravinsky's "Rossignol." Such training apparently pays off, for members of Blumenfeld's Opera Studio have gone on to sing with top-flight companies all over the world.

BUT WHAT OF THE FUTURE of the Performing Arts Area on campus? What are its prospects? The general prognosis is one of optimism. Says Dean Kling: "The construction of the student center with adequate theatre facilities will open up new perspectives for the performing arts." And what are the chances for getting this much needed theatre? Nobody really knows, but again the feeling seems to be that it will come.

Perhaps Sidney Friedman put it best when he said: "I think that eventually things work themselves out. If the quality of the productions and instruction is good, somebody up there will love us. What I mean is that somebody out there in the big world with lots of bucks will make it possible for us to have a first-rate theatre. And I'm sure that somebody in the administration will also love us. I guess maybe I don't condemn Willy Loman (the key character in Arthur Miller's 'Death of a Salesman') altogether—I guess there's something to being liked."

Meanwhile, the Performing Arts Area is not holding its breath. It has staged two stellar productions this year "Threepenny Opera" and Lorraine Hansberry's "Sidney Brustein's Window," and four more are in the works—an opera, a dance concert, and two plays. In February, it will present Tennessee Williams's (himself an ex-Washington University student) "Glass Menagerie," with alumna Mary Wickes as artist-in-residence. With such a schedule, it's no wonder that Herb Metz says of the Performing Arts performances: "We're the best bargain in town at seventy-five cents or a buck-fifty."

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Walter B. Kromm, Bachelor of Architecture, 1951, is a partner in the St. Louis architectural firm of Kromm, Rikimaru and Johansen. As an architect, he is deeply concerned about the elements that are adversely affecting our society—the much-publicized ones, and the lesser known one . . .

V I S U A L P O L L U T I O N

By WALTER B. KROMM, B.Arch. 51

POLLUTION HAS BECOME a household word in American society. Air pollution is of vital concern to everyone, including the suburbanite who ponders what to do with his leaves when legislation prohibits burning them. Water or stream pollution has reached a level where regional agencies have been formed with the authority to enforce laws that have teeth in them. These are both common and recognized forms of pollution.

As an architect, I am concerned with a less common form of pollution. It is one that does not, at least at present, endanger the physical well-being of Americans but it could have serious effects on our mental and economic well-being in years to come. I prefer to call this threat "visual pollution," for like its air and water counterparts, it threatens to blight our cities and suburban areas. Yet, it is made up of countless minute, almost unnoticeable, particles or elements.

There are, of course, various types of visual pollution. The visual pollution of the typical city slum is but one aspect of the deep social, political, and economic disorder of our cities. In rural areas, visual pollution takes the form of unsightly billboards proliferating along our highways. In the city or the country, visual pollution

seems to stem from short-sighted economic expediency and a disinterest in the aesthetic environment.

The particular form of visual pollution to which I would address myself, however, is the aesthetic disorder so prevalent on our link streets—those streets or avenues which connect our residential communities to our places of business. They are, for the most part, commercial streets which contain stores, small shopping centers, gasoline stations, hamburger stands, and the like. They are the shopping streets that provide us with many of the goods and services we need. These link streets creep insidiously into our most handsome residential districts and extend themselves into our downtown business areas.

IT HAS BECOME VIRTUALLY impossible for the city dweller to escape from experiencing the undesirable visual effects of these link streets, just as it is becoming increasingly difficult to escape from air and water pollution. The goods and services, and the businesses that provide them are necessary and desirable. What is unnecessary is the unkempt and disorderly appearance of most of these link streets.



Motorist shoppers seeking a specific place of business are confronted by a maze of confusing signs on most of our link streets.

We in the United States tend to care about the visual quality of our residential streets. We plant trees and manicure our lawns and, in general, manifest a pride in our homes, which results in a satisfying and orderly visual effect. Our downtown business districts tend to generate a desirable visual excitement that is influenced and controlled by high economic value and high population density. The link streets, for the most part, have escaped the concern of the individual and the community. And we suffer for it.

I SHALL ATTEMPT HERE to identify the major elements which cause this undesirable visual pollution:

The first offenders are the utility poles and overhead wires that are proliferating at an alarming rate. The poles sprout cross arms at various heights which cant crazily towards all points of the compass. The wires are like giant spider webs, but they often lack the geometric quality of webs and tend to sag in uneven arcs and to radiate in all directions. Year by year, as demand increases, the poles are increased in height and wires

are added until they present an overwhelming presence. Pole-mounted transformers add to the disorder and wires loop from poles to buildings in an unsightly manner.

What should be done, as part of a long-term project, is to place gradually most overhead utilities underground in properly designed conduits. This is a vast project and it requires a vast solution involving the whole community. It is not something we can, with fairness, place solely on the utility companies and expect them to solve for us. The public must first develop a strong desire to rid itself of this form of visual pollution and then work through government and the utility companies to correct the situation.

The second offender is the advertising sign. A merchant on one of the link streets naturally identifies his establishment with a sign or two. Then, because he realizes that he is competing for motorist customers and their attention, he does what his neighbor merchants have done: He begins to add signs. He plasters his store windows with paper signs blating meaningless messages. He festoons his building with additional signs of varying shapes, sizes, and colors. The result is self-defeating. The



Cheaply-constructed signs and buildings are often objects of neglect and are the chief contributing elements to visual pollution.

motorist, in a hurry to reach his destination, ignores such signs. On the other hand, the motorist shopper must creep along at a snail's pace in order to locate the shop he seeks among such a Dismal Swamp of signs.

THE PRIVATE MERCHANT is not the only contributor to visual pollution through poor sign practices. Our federal, state, and local highway traffic engineers seem bent upon creating a maze of signs that may eventually result in a coast-to-coast traffic jam. We are so overstimulated visually with traffic signs that we are in danger of seeing nothing.

On the link streets, utility poles and traffic signs resemble mud-flat piers at low tide. Woe to the poor out-of-town motorist who must wend his way through this maze of signs during a rush hour period.

The constricting aspect of on-street parking speaks for itself and off-street parking is frequently inadequate. The parking lots tend to be great seas of asphalt. The entrance and exit lanes are often poorly marked and the differentiation between sidewalks and parking area is frequently non-existent.

The final offenders on our list are the commercial buildings themselves. They tend to be disheartening structures. The well-designed and well-constructed buildings become lost among these lesser neighbors.

Low economy construction, which is the usual standard, tends to result in substandard buildings. By and large, cheap materials result in high maintenance and it follows that if the buildings do not receive constant care and attention, they deteriorate. Because of our tax structure, the promoter is encouraged to erect the cheapest buildings possible. The public loses when the buildings deteriorate and contribute to visual pollution. It takes very little more to develop well-designed, well-constructed buildings that are pleasant to be in and pleasant to see.

The apt term "googy" architecture was coined several years ago to describe buildings that have a certain visual shock effect in themselves. A building built in the shape of a hot dog to advertise that it dispenses hot dogs (of course) is but one example. We have further manifestations of "googy" architecture in filling stations with gigantic arches over their pumps, and drive-in hamburger



Simplicity and good taste in design have resulted in legible and visually pleasing signs in this Dallas shopping center.

stands built in the shape of indian teepees and what-not. Like the catchy television commercial, it's something to see the first time and something to avoid from then on.

I HAVE ENUMERATED some of the elements which cause visual pollution on our link streets. Some link streets are so well planned and constructed that you find none of the things I have mentioned. Others, to the contrary, contain all of the elements.

I feel that there is a definite correlation between visual pollution and the mental attitudes of the people who are exposed to it. We involuntarily respond to forms and shapes. Multi-shaped solids and voids tend to contribute to a sense of mental disquiet. The telephone poles, the signs, the oddly shaped buildings, when intermixed in a thoughtless pattern, become jarring elements. These same elements, when reduced in number and carefully arranged, can become a pleasant environment which induces a corresponding sense of well-being. Certain large shopping center developers have discovered this truth and they have turned this knowledge into economic gain.

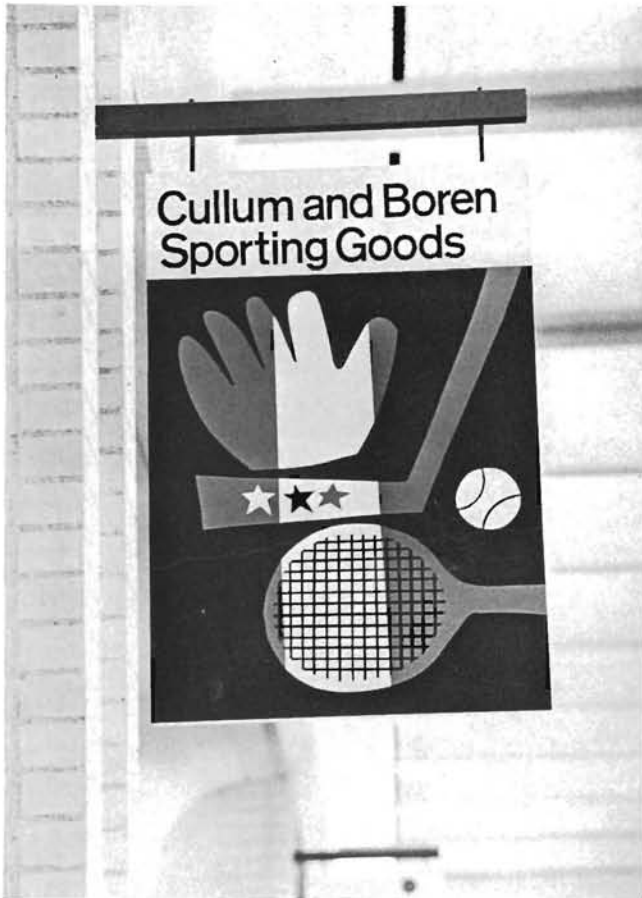
Many European towns have practiced this principle of restraint and good design on their link streets, to preserve their charm. They extract admiration from the visitor and contribute to the well-being of their citizens.

Profuse use of bright colors and flashing lights disorients the viewer and can be a serious distraction when driving an automobile. Controlled use of color can give proper and desirable emphasis when needed, while uncontrolled use tends to distract.

Finally, a cheap and shoddy environment nurtures in the beholder a sense of carelessness and lack of concern.

ASSUMING THESE OBSERVATIONS are true, then visual pollution has a negative influence on those of us who are forced to experience it. I maintain that the effect is often more subtle than shocking. We can even be led to believe that we are immune to the deteriorating effects of visual pollution, but studies in motivational research prove otherwise.

What is needed for the eventual elimination of visual pollution is an expanded awareness of its presence. The



The shopper has no doubts about the goods and services offered by this sign . . .



. . . while this one informs him and perhaps brings a smile. No pollution here!

public must want to live and shop and drive and work in a pleasant environment. They must be willing to pay the cost of upgrading their physical surroundings or they will pay the greater cost of mental abrasions.

UNtil the public attitude builds as a strong force against visual pollution, we have only imperfect tools to help retard its progress. One of these tools is the zoning ordinance. No new commercial districts should be permitted to grow without adequate zoning laws. Most communities have such laws, but they are usually easily circumvented and often it is possible to obey the law to its letter while violating it in spirit. What we need are laws which define the spirit and allow for creative economic and aesthetic solutions.

We need sign control laws which impose a limitation on size and number. Such laws will work to the advantage of the merchant by imposing the same restrictions on his competitors. Restraint is also needed by our cities in erecting traffic lights and signs. Montreal, Boston, and Baltimore have sought the aid of design groups and the

results of their efforts are now becoming apparent. The International Committee for Breaking the Language Barrier, an organization of travel, tourist, and business groups, is seeking to universalize sign practices throughout the world. This organization is competent to assist any city desiring to clean up its clutter of signs and markers.

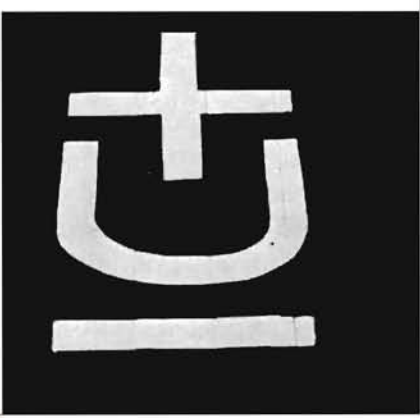
We also need a cooperative effort on the part of the government, the public, and the utility companies toward the eventual installation of underground wires. Properly designed underground conduits can be a functional aid to the utility companies and a great boom to the aesthetic appearance of the city.

Finally, our cities must take another look at their taxing laws. We should stop the practice of rewarding those who build substandard developments with lower assessed valuation and resulting lower taxes.

If we do all of these things, we can stop the visual pollution that is eroding both our physical and mental well-being. We can stop it if we recognize it for what it is and decide to do something about it.



Part of the Cross U Bar herd of Arabians forms a tableau of horseflesh behind alumnus S. Watts Smyth. Most of Smyth's horses are bays, or brown in color.



ARABIANS FROM WYOMING

TO ARABIAN HORSE fanciers, the Cross U Bar Brand is a well-known symbol of quality. To Washington University alumnus S. Watts Smyth, the Cross U Bar represents more than thirty years of hard work that has resulted in his position as one of the major breeders of Arabian horses in the United States.

Smyth, who received his degree from the University in mechanical engineering *in absentia* in 1917—like many other college seniors, he found himself in the U.S. Army at commencement time that year—is the owner of the 5000-acre Cross U Bar ranch near Big Horn, Wyoming.

The St. Louis native and his wife, the former Jane Goddard, acquired the Cross U Bar from its original owner in the mid-1930's with the intent of raising purebred Arabian horses. The meager profits from their initial breeding herd of one stallion and four brood mares were supplemented by more lucrative breeding ventures: supplying mules for the yet-to-be-mechanized cotton industry in the South, half-bred Arabian horses, Palominos, beef and dairy cattle, and more recently, Shetland ponies, while they were a profitable fad.

"It takes money to raise purebred Arabians," Smyth stated candidly, "and these sideline operations helped us build our herd. Today, we raise only Arabians, although we still have a small herd of Shetlands on the ranch."

Today's Cross U Bar Arabian herd includes approximately 75 mares and four stallions, considerable progress from the nucleus herd of the Depression years.

"The Arabian represents centuries of refinement as a desert war horse," Smyth said proudly. "He is the progenitor of all the recognized breeds of light (not draft) horses. Friezes from the ancient cities of the Near East show Arabian horses, easily recognizable by horse experts."

Why is the Arabian such a prized animal among horse fanciers and owners? Smyth was asked. "He is almost a different genus of equine," the tanned rancher replied. "He's very well disposed toward humans and has a tremendous capacity for intelligence, since his brain cavity is almost double that of other horses." Smyth continued, "Because of his gentle nature, he doesn't need to be 'broken' like other horses. I wouldn't have a 'bronc-stomper' on the place. All that is necessary is quiet direction, for the Arabian wants to learn and do what is asked of him."

Smyth credits other unique characteristics for the Arabian's immense popularity throughout the equine world. "He has one fewer vertebra in his back and two fewer in his tail than other horses. Like a shorter bridge span, he is stronger and has more carrying power.



“And he rarely has leg or foot problems since the bone in his foreleg is so dense that it weighs the same as that of a Percheron, one of the largest horses in the world. Lots of people think Arabians are dainty and fragile, yet they’re one of the world’s toughest horses.”

Untrained Cross U Bar foals are sold at a base price of \$1000 for stud colts and \$1500 for fillies. “The higher price for the female is due largely to tradition,” Smyth explained. “Fifty years ago, an Arab chieftain wouldn’t part with a female horse because the Arabs value the mare more than the stallion; just the opposite of their feeling for the human race. Also, more stud colts are produced than fillies, so there’s a natural demand for the female.”

Smyth shows his horses in competitions from the Mississippi River west. Shows are an important part of Cross U Bar advertising since a foal’s price can be greatly affected by his parent’s performance in competition.



A Cross U Bar mare and her foal are led through the ranch yard by Bill Baker, who has been a hand on the ranch for twenty-two years. All young horses are called foals, with males being termed stud colts and females, fillies.

“Depending upon what he’s done, a prize Arabian stallion could command a price as high as \$75,000,” Smyth commented.

The Arabian’s popularity is also due to the *natural* animated action he uses and the *natural* high carriage of his tail. These are both “developed” through training and the use of artificial appliances in other breeds. All of these qualities combine to make the Arabian an animal with tremendous appeal. He is used as a working horse or pleasure horse and is also used extensively to improve non-Arabian stock through breeding.

The Smyth ranch is in high country with its 5000 acres ranging from a low 4500 feet above sea level to heights of over 9000 feet in the mountains. From their home, which sits in a tree-sheltered valley surrounded by a bowl of range land and mountains, the Smyths can enjoy an unmatched view in any direction. They are reaping the fruits of years of hard work built upon a splendid animal that has sturdy legs and three fewer vertebrae than any other member of this species.



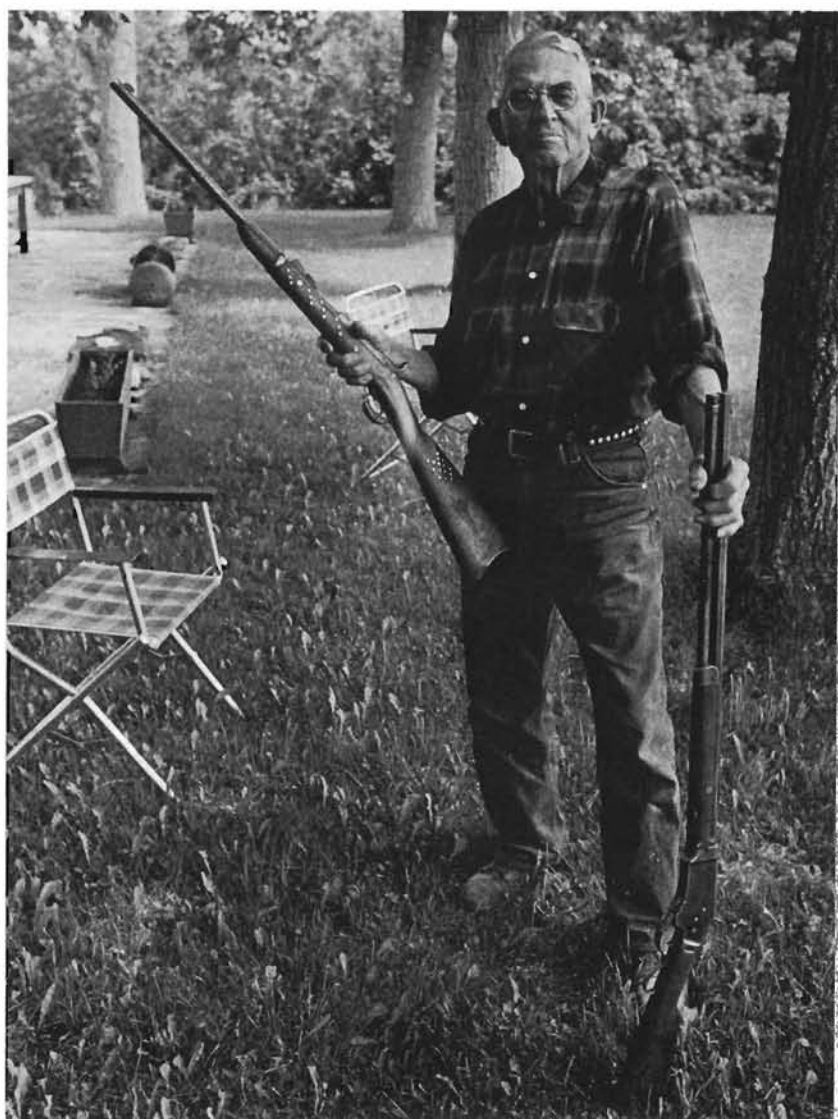
Smyth stands in front of his home and the headquarters of the Cross U Bar. The “Mountain Spanish” house was designed by St. Louis architectural firm Maritz and Young and was built in 1940 of native stone and wood.

Watts and Jane Smyth are childhood sweethearts who grew up near Washington University's South Forty. Avid ice skaters, they pursue their hobby on a wintertime rink in one of the ranch buildings.



Arabian horses gallop across the Wyoming countryside. The ranch has approximately 5000 acres, most of which is used as range land. Smyth says, "The rest is nice to sit back and look at."

ARABIANS FROM WYOMING



Fred Hilman is the grandson of the founder of the ranch and is the oldest living white person born in northeast Wyoming. He holds his grandfather's rifle which sports the toothmarks of a bear his grandfather fed the rifle to after missing all his shots.

Since Sputnik I, there has been a moratorium on the educational philosophy of John Dewey. Today, when there is a danger that our schools are becoming "agents for alienating the young from society," Professor Wirth observes that it is time to re-examine the Deweyan Tradition to determine if it has relevance for our times. This is a revised and expanded version of Dr. Wirth's article in the December, 1967, issue of The Record, published by Teachers College, Columbia University.



Dr. Arthur G. Wirth is professor of education at Washington University and the author of *John Dewey as Educator: His Design for Work in Education, 1894-1904*.

By ARTHUR G. WIRTH

Professor of Education

THE DEWEYAN TRADITION REVISITED

THERE HAS BEEN A MORATORIUM on the use of John Dewey's name in recent years. There are hazards in referring to him. To mention Dewey is to flaunt the fact that you are over thirty, and the young have made clear how much confidence they have in persons of such vintage. In addition, you demonstrate that you are hopelessly out of touch with current professional terminology: educational hardware-software, modulation, simulation, the "teacher and his staff" processing "teacher-proof materials," and much more.

The moratorium extends even into the conclaves of the philosophers of education. At their 1967 convention in New Orleans there was a session on "Critiques of Recent Literature in Philosophy of Education." The four main areas reviewed were: (1) Analytic philosophy, (2) Catholic philosophy, (3) Existential philosophy, and (4) "Is there any other?" That is quite a switch from the days not long ago when the name of Dewey was much in the air at these meetings.

Why the silence? There is no doubt that an opprobrium came to be attached to Dewey's name in the years after Sputnik I. The tendency was to assume some causal connection between Dewey and whatever weakness one was worried about in American education. In the public media Dewey was equated with progressivism and progressivism was equated with anti-intellectualism, soft-pedagogy, unruly children—perhaps even a vague subversive-ism.

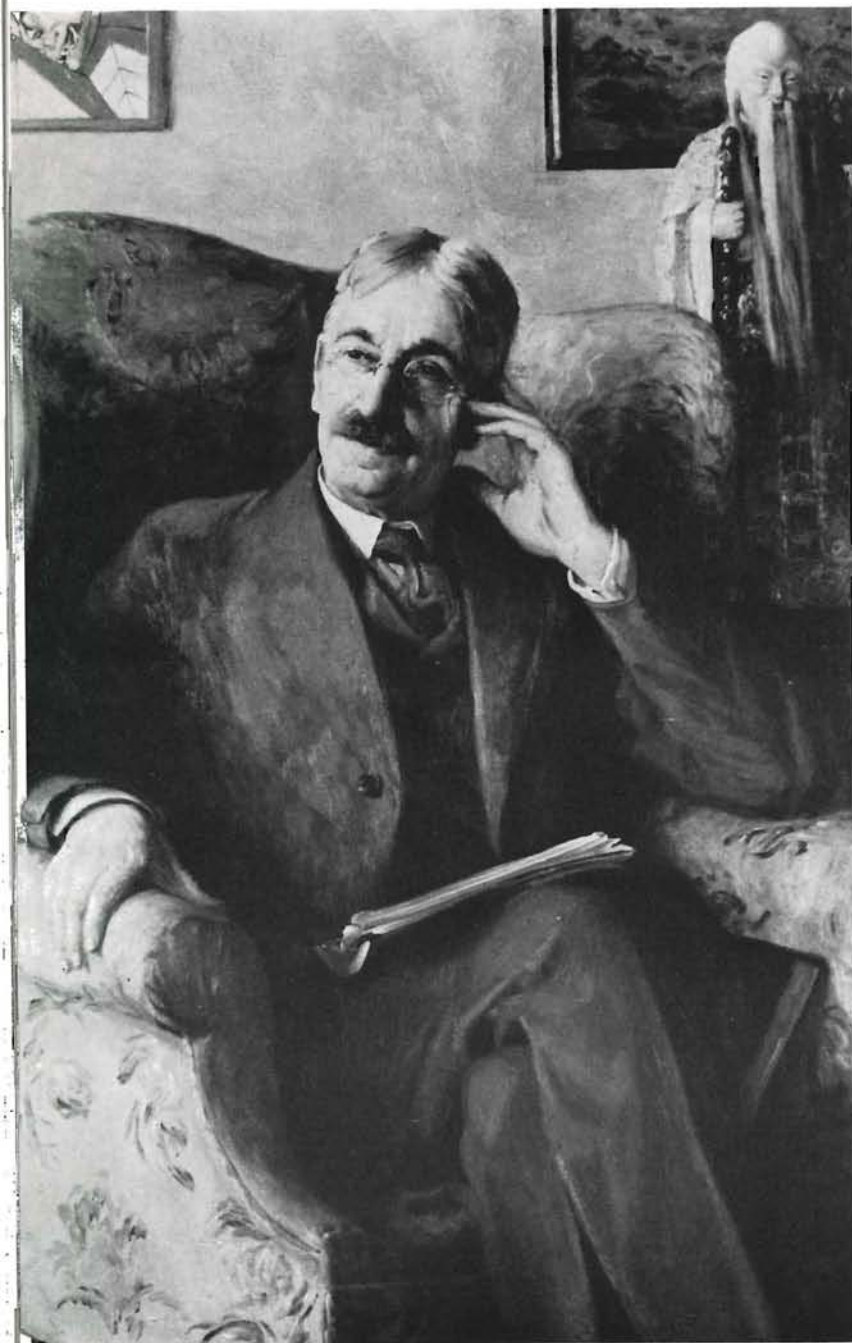
Whatever the reasons, I am one who happens to think that there is merit to the moratorium. A turning away from revered figures seems to be in vogue in various fields. (One thinks of the advice coming from avant-garde spokesmen in theology.) A substantive case for the decline in talk about Dewey is that we had arrived at a point where the terminology associated with his name—reflective thinking, problem-solving, democratic process, etc.—had taken on the quality of incantation. Tired terminology can mesmerize its users so that they get encapsulated and lose contact with reality. Bombardment from outside is then not only inevitable but salutary.

So I am not bothered by the moratorium. On the other hand, I simply feel that important aspects of Dewey's point of view have not lost their relevance to American culture and American education. If that notion is presently not fashionable, I am not disturbed. I shall give several examples of Dewey's thought that continue to have staying power. If we lose sight of these and others simply because he is out of style, *we* will be the real losers.

I want to give examples that grew out of my study of Dewey's work at Chicago (*John Dewey as Educator: His Design for Work in Education, 1894-1904*). My purpose in returning to this period was to get behind the clichés and to re-check what Dewey stood for when he founded and directed his own Laboratory School. I wanted to analyze the kind of thinking about education he was doing at the one point in his career when he was directly involved as a practicing educator.

My first example has to do with the curriculum rationale of his Laboratory School. This feature of his work was relatively neglected in the period of his popularity when the progressives concentrated on methodological innovations. The curriculum was based on Dewey's sense that twentieth-century men were entering a new stage of human development. A primary task of formal education was to help the young develop insight into events that were transforming the human situation. From this thesis Dewey located integrating themes which he hoped would give coherence to the curriculum from the kindergarten to the university. Recently, of course, this kind of concern for coherence has been lacking as we have worked by reform projects on separate bits of the curriculum (although we may be seeing a revival of interest in integrated plans as the systems analysts are getting involved). If, as I am arguing, Dewey's educational rationale was aimed at helping men adjust to a new stage of human experience we must ask the questions: What is the new stage of man? What are man's critical needs in entering it?

For answers to these questions I shall not use Dewey's words, but those of several perceptive contemporary com-



Portrait of John Dewey, noted American philosopher of education.

mentators who are representing *now* the point of view expressed by Dewey at the opening of this century. I refer to Kenneth Boulding, economist and social philosopher, at the University of Michigan and Elting Morison of the California Institute of Technology.

Boulding, in *The Meaning of the Twentieth Century*, begins by saying "The twentieth century marks the middle period of a great transition in the state of the human race." He holds that we are beginning to leave a stage of civilization that gradually took shape from the Renaissance to about the beginning of the twentieth century. It culminated in producing revolutionary change agents: science, technological inventions and innovations, and the combination of these with organized research and development operations—all of which, in turn, are leading to global social change and invention. The result, according to Boulding, is that "the technical changes introduced by the scientific revolution are so great that we are passing into a new state of man. . . . This is the meaning of the twentieth century."

He refers to this emerging era as the stage of the "technologically developed society": a stage where the workings of man's mind—as represented in the explosive power of scientific knowledge and modes of inquiry, harnessed now through research and development processes—become *the fundamental agents for transforming* the quality of life on this planet—and beyond it into surrounding space. This theme is sounded also by Elting Morison in *Men, Machine, and Modern Times*, in which he agrees with Boulding that the paramount tasks of our time are: (1) to give men insight into the nature of the transition we are in, and (2) to provide the temper of mind and skills to enable men to cope with the new order of world realities.

"The most important invention for the future lies [in] the way we are to deal with all the new conditions produced by the new machines and ideas." The rate of change accruing is placing enormous strains on individuals and human institutions. Morison argues that to avoid a variety of disasters the paramount problem is to develop the attitudes and skills that will enable men to face this radical change without feeling overwhelmed by it—while learning to assess consequences so that change can be directed toward humane ends. As he puts it, the critical task is "to create a mood and means that will enable the members of society to explore new instruments and procedures by designed experiments while pondering alter-

DEWEYAN TRADITION REVISITED



natives and reserving judgments until the returns are in.

"In all the areas of difficulty and doubt—transport, the organization of cities, the control of traffic, the intelligent, indeed, the loving care of the sick, the process of education, the structure of existing institutions, and the like—in all these areas the development of a series of small experiments, with the means available for observing the evidence produced and analyzing the results, would produce a set of alternative solutions and the data necessary both for fuller understanding of the nature of new situations and for intelligent selection among alternatives." If we can create such an experimental or hypothetical mood in the society at large, then "members of the society can have a direct part in the decisions affecting the shape of the society; by offering the possibility of reasoned change, it may measurably reduce the natural human resistance to changes not fully understood."

We had an example of such a style of thinking in the St. Louis area when Professor Barry Commoner of Washington University proposed to a sub-committee of the U.S. Senate that a pilot program be instituted to find technical, economic, and administrative solutions to the air pollution problem. Note that he did not propose a sure-fire panacea, but a pilot program in which possible solutions would be put to a test, evaluated, and modified or elaborated as feedback comes in.

While a couple of quotations cannot give a clear indication of the thesis to which whole books are devoted, I hope that they convey something of the conviction of these authors that the twentieth century is ushering us into a new stage of human experience. Science, the modes of inquiry represented in science, and technological inventions tied to it are the great transformers. No area of the globe now is unaffected.

THIS IS, OF COURSE, the point of view that Dewey took as his departure point in designing the program of his Laboratory School—and it was a major theme in his philosophical work in general. As he saw it, the great task, as we came into the twentieth century, was to foster the attitudes and skills of experimental inquiry combined with a concern for democratic values. He did not offer the curriculum of his Laboratory School as *the* answer. It was, however, an imaginative curriculum effort integrated around the theme of providing insight into the critical events in the human past that had led to this twentieth-century moment. The approach was essentially

anthropological. Dewey chose to focus on what he called the "occupations," i.e., the basic modes for producing life necessities, as basic items of inquiry. His thesis was that basic changes were effected in the total pattern of culture when the form of the occupations or activities required to produce the necessities of life, like food, fuel, etc., were changed. Thus in the early elementary grades there were units in which children studied the interrelated consequences that developed when men passed from primitive hunting and gathering societies, to pastoral, then to agricultural, and to commercial stages.

Always attention was centered on critical factors that were change-producers, such as the domestication of animals, the introduction of new metals, and on the complex interactional effects following these for the total pattern of social life. Thus, in Phoenician culture the changes when men entered a commercial stage were studied—changes in modes of transportation, in the political, economic, and religious patterns, and the impetus given to symbol systems, both alphabetical and numerical. Later units explored the effects on man's experience that derived from the expansion of Europe and the consequences of cultures interacting on each other.

As study in the upper elementary grades shifted to this country, extensive units were concerned with a study of the changes that occurred in human life in one geographical region—the Chicago area. There were early units on the culture of the Plains Indians, then analyses of the conflicts of culture which followed when the European explorers and fur traders entered the area. A sequence of units traced what happened as this stage gave way to pioneers, farmers, and new commercial ventures; what happened when water and wagon transportation gave way to the railroad, and packing plant complexes required new supplies of cheap immigrant labor. While the Dewey School did not continue long enough to work out the details, the stage was set to show how the complex problems of industrialism, urbanism, and commercialism required that men learn how to learn at levels never required before. This required, for one thing, the establishment of university campuses as research centers to advance knowledge and techniques, and the need to put the lower schools in touch with the modes of inquiry generated there. Chicago, of course, gave birth to the University of Chicago in the 1890's which within a half century was to produce the research that released the energy of the atom.

Pivotal to the curriculum rationale of Dewey's school was the "web of culture" concept. The goal was to help students to see how the aspects of a society were inter-related—economic, technological, political, aesthetic, intellectual, spiritual—and to learn that when fundamental change-factors were introduced, the whole pattern of relationships was transformed and human experience entered into new stages.

Parallel to these historical units were studies in the sciences which dealt with man's understanding of his natural environment—how this understanding led to an increase in the ability to control the forces of nature which, in turn, transformed social and cultural life.

All of this was to aid the gradual realization that previous history had led men to the point where the human mind—as now represented in the modes of thinking in science and the harnessing of knowledge to techniques—has become the radical planetary change agent. If the curricular orientation was to provide this kind of perspective, the *methods* were to give students experience and insight into grasping the new attitude on which science was based. By engaging in a series of inquiries in shops, laboratories, gardens, and in studies in the "occupations," children were to develop the tentative, critical attitudes that go with the experimental temper of mind.

A SECOND MAJOR ASPECT of Dewey's philosophy was his concern with the meaning of the new turn of events for *democratic values*. A distinctive feature of his thought was his conviction that the educational objective of developing the experimental and critical attitudes and skills was to apply to *all* children—not just to an intellectual elite in the society. There were at least two reasons for this: One was a functional reason—a society that was to move into "the next stage of man." The scientific-technological-change-oriented stage had to have available throughout its population the quality of mind needed to make such a society viable. An anecdote told by Professor F. S. C. Northrop illustrates the point. He underscored the difficulties of introducing new technologies into cultures whose peoples have not been steeped in the modes of thought related to science with an anecdote about Asiatic peasants who could see no point in periodic lubrications of new tractors since the machines had been "anointed" the first time. It is futile or dangerous to introduce the products of science and technology into a society unless its peoples are being helped to acquire the conceptual and attitudinal values that are intrinsic to the culture of science.

A second reason was related to Dewey's concern about whether the values of free men could still apply in a complex, science-oriented, big-system kind of society. There is the possibility that such a system will, in fact, require an elite of brains and power which will scientifically engineer not only the physical and energy aspects, but the human material as well—everyone will be measured and conditioned to fit into the slot which is efficiently right for him. Soma pills or some other happy gumdrop will keep us in a continuous smiling, euphoric state while we perform according to plan. Dewey resisted this. He insisted that the attitudes and skills of the

mode of experimental inquiry had to be made widely available to children of all classes and groups to make it possible for them to be responsible participants in a change-oriented society. And he operated from the faith that, with proper educational aid, such attitudes and skills could be acquired by the majority of men.

Dewey was aware of the evils of manipulation that could come from the creation of huge impersonal megalopolises and rigid bureaucracies. There was the possibility that men would feel overwhelmed and powerless and lose meaningful freedoms. The dangers were real. It was not Dewey's style, however, to react with anguished hand-wringing, nor with self-serving bleats about the need to drop out. The perilous and the threatening were not new in human experience. History does not assure us that answers will always be found. Dignity comes, however, from persistently trying to apply intelligence, imagination, even courage on problems which seem intractable.

If the participatory values of free men were to have a chance, Dewey insisted that they had to be learned in living communities. Schools, where the young were nurtured, could perhaps be created into communities where the tough problems of implementing the techniques of free, responsible participation could be confronted in practice. Those schooled in such experiences later might be able to bring imagination to bear in creating arrangements for fulfillment and democratic involvement even in the huge communities in which twentieth century men are destined to live. If Boulding and Morison are right, this is still the paramount task as we approach the last three decades of the twentieth century and it applies now to people all over the globe.

Thus, three major themes in Dewey's school are: (1) to provide students with a mode for understanding the evolution in human experience which has led us to our present period of transition, (2) to develop both the attitudes and skills of the experimental mood and method which are indispensable for meaningful participation in the emerging reality, and (3) to learn to weigh the consequences of change in terms of its harm or support for human values.

These relate to a fourth point. In Dewey's epistemological theory the process of inquiry was characterized by continuing interplay between conceptual-theoretical work and the check of ideas against the stuff of reality. This had implications for his pedagogical theory. He accepted the fact that the major function of the school is to provide conceptual training. It necessarily has as its business the teaching of the heritage which is contained in verbal and mathematical symbols. But this inescapable duty poses also a constant danger. Whenever the work of the school becomes exclusively abstract the school is in danger of becoming isolated from the real world. Students (some at least) will sense sterility and will rebel or cut out. Dewey, therefore, reached for pedagogical devices at the elementary level—occupations, field trips, school gardens, cooking, etc.—to give children a sense of the functional relation between knowledge and ideas and the everyday-ongoing life of men. His theory at the secondary and higher educational levels endorsed the de-

sign of educational approaches that tried to place youth into some meaningful relation to the out-of-school community. (The Antioch plan, for example, was influenced by Dewey's frame of reference.)

This is not the place to elaborate the point, but I think it is becoming clear that we are going to have to reconsider this emphasis. We are developing a post-Sputnik hangover. There is a clear case for academic excellence, but we also see some of our most interesting kids at the secondary and college levels rebelling against the effort to monopolize their lives with the academic grind. They resent the isolation of education from life that Dewey warned against. When a society places its entire youth population in classrooms until they approach age twenty, it is fair to ask if schools become agents for alienating the young from their society. Our youth are hungry for genuine participant roles in the off-campus community as well as within it. Some of them are refusing to sit still for the endless game of exam taking and mark collecting. One of our most pressing tasks will be to develop programs that will enable youth to be meaningfully related to the out-of-school world and to learn how to use such experiences to advance theoretical and conceptual studies.

We need to examine imaginative projects being tried here and there. We need to re-think uses to be made of summer programs in which cross-sections of our youth could be put to work on neglected but vitally needed social tasks, in reclamation projects in mountain areas, clean-up projects in urban slums, etc., or as the Russians do in polytechnical education: give their promising secondary and college age students experience in industrial laboratories or experimental gardens, without forcing them to wait until they get their Ph.D.'s.

FINALLY I REFER to Dewey's pioneer plan to transform school-keeping into a teaching profession that would be experimental and inquiry-centered in mood and practice. He had a responsibility in this area as he was chairman of the combined Departments of Philosophy, Psychology, and Education at Chicago.

Operationally, Dewey argued that a profession is dependent on basing practice on a body of theory as opposed to empirical, rule-of-thumb practice. In his view this meant that educators had to be committed to building, slowly and progressively, a more sophisticated body of theory and practice that would grow out of inquiry. Specifically, he proposed a triadic pattern of collaboration. At one level would be investigators working at the abstract conceptual level, trying to clarify understanding of such basic factors as motivation, the nature of human learning, etc. A second group of people, middle-level theorists, would work in collaboration with people in the classroom and those doing research at the more abstract levels to develop series of hunches or hypotheses relevant to pressing problems of the schools. These hypotheses would be dependent on the collaboration of classroom teachers. These teachers, who themselves would be prepared in skills and attitudes for investigation, would try the ideas; they would provide feedback to the researchers at the other levels. In addition, they would also be the

source of providing their own kinds of hypotheses for defining problems that require joint collaboration in seeking solutions.

The most important thing in this plan is that Dewey was taking an approach to education that would present us

with a defense against the diseases of ideological thinking or faddism. Instead of constantly having to struggle to remain at the crest of whatever is the latest new wave, Dewey was arguing that, in effect, we should admit the large areas of our ignorance and insist on having the right to approach problems of the profession in the spirit of experimental inquiry. This would mean that ideas for change, instead of being regarded as the "new gospel," would be treated as ideas to be tested and evaluated. Practice would provide feedback and correctives for modification, for rejection, or for acceptance. To come to the job in this spirit might relieve us all from the pressures of having to keep up with the Joneses in the next school district. An alternative to being nervously "on the make" is to work from a sense of being an honest workman. It can bring a refreshing sense of self-respect. In the Graduate Institute of Education we would hope, however imperfectly, to make a contribution to supporting such attitudes and skills.

An insistence on applying the modes of experimental inquiry to the work of the profession has new relevance and urgency today. We have entered the era when the giants of the communication industry—R.C.A., I.B.M., Xerox—have discovered that education is big business. Great issues for educators are at stake which can't be discussed here. The profession is on the spot. It will be taking significant action even if it decides "to go along" to find out what "they" come up with—or if we all rush off to join 'em by jumping into the flesh pots. It is just possible that the profession might take another stance—move to insist that professional standards and safeguards be applied before schools are flooded with hardware and software.

It may even be time to revive the Laboratory School idea, this time, perhaps, supported by regional labs and universities. In such schools the profession might ask the corporations to subject the technological and curriculum innovations to experimental scrutiny. The value questions regarding consequences for human beings—as well as functional results—would be included in inquiry designs. Since our level of sophistication in research techniques has advanced since our earlier experience with laboratory schools, we might insist that this time they not be primarily *demonstration* schools, which could become merely advertising centers for corporation products, but that the emphasis be truly experimental, with the hard and honest questions to the fore. If that happens the vitality of the tradition of John Dewey will be demonstrated.



Riding a rubber raft through the Grand Canyon on the roaring Colorado River was an exhilarating as well as an educational experience for members of the Washington University Outing Club, Bill Jud, then president of the student organization, describes the adventure, with many sidelights on the geology and the colorful flora and fauna the group encountered.



RAPID TRANSIT

ON SUNDAY A PARADE of storms marched by, each beginning with a sudden temperature drop and whipping wind and maturing into a deluge. The rain would pass in about twenty minutes and the cloud would rumble away over the canyon wall. Off in the west we could see the next storm coming, and behind that the next one. For a hundred miles the storms were spaced like a procession of elephants, one following the other over our heads about every hundred minutes.

These storms were part of the scenery at Lee's Ferry, Arizona, the starting point for the Washington University Outing Club's expedition to the Grand Canyon last summer. The Outing Club is an organization about as loosely knit as an old sock. The group's avowed purpose is to go camping or canoeing or something else in the out-of-doors once in a while. Its origins are lost in antiquity. On this eleven-day float trip there were nine members present, four of whom decided to participate in only the first four days of the trip. Also along were three guides and several others who weren't members of the club.

At about nine o'clock Monday morning the John Cross Explorations Company trucks lumbered into camp with our expedition's equipment. The big rubber boat came deflated and wound up like a jelly roll. With one good kick, John Cross, the head of the company and one of our three guides for the trip, pushed it from the truck bed and unrolled it on the beach. An adapted vacuum cleaner did the inflating.

A float party will ordinarily use two boats to insure safety, but we were able to use just one by lashing on auxiliary flotation cells. These cells also helped to stop some of the water that washed over our boat in rapids. John placed the wooden beam frame and outboard engine on the raft and we loaded our gear. After a final check on the equipment, we shoved off down the Colorado River.

Lee's Ferry geology is best described as a series of sandstone and shale layers which dip upward at about seven degrees in the downstream direction. The ferry site is slightly upstream from the mouth of Pariah Creek, where a massive sandstone unit dips below water. Because of the slant of the rocks, the canyon walls quickly surmounted us as the float got under way. During the next

week these walls increased from hundreds of feet high to giants towering more than a mile above us.

The rapids of the Colorado River are formed where tributary streams discharge into the main river. These streams run straight down the canyon walls and their waters attain considerably greater velocity than those of the Colorado. It is for this reason that the streams in the side canyons are able to transport boulders much larger than the Colorado is equipped to handle; thus, masses of stone are dropped where the tributaries discharge, creating natural boulder dams and rapids.

Our first white water of importance was Soap Creek Rapids. We beached the raft and walked downstream to scout the rapids before attempting passage. As do most rapids, this one has a preferred channel through which rafts can travel safely. The channel shifts, however, with changes in water level and with each flood. Getting stuck on one of the truck-sized rocks can be bad, since the river can wash over a stalled raft in waves six feet deep with a 30-mile-an-hour current that can toss passengers and gear into the river.

Soap Creek Rapids went well. The stretch lasted nearly two minutes, with the boat falling about thirty feet in a quarter-mile reach. Many times the stern was tipped seven feet above the bow. We slid over the smooth fore-rapids water into little ripples which grew from a few inches to a foot in height, and then we dropped smoothly down the first fall on a broad tongue of water, plunging over an automobile-sized rock. The water instantly turned white and leaped into our raft. John Cross manned the engine and steered us right through the roughest part.

TOWARD EVENING WE beached for camp on a sand bar at one of the tributary canyons. The sand was of fine and uniform grain, without silt, and was comfortable to sleep on. The cliffs now towered nearly a thousand feet above our heads. We set up our sleeping bags at the base of one of these cliffs, although it looked cracked and unstable as could be. It helped not at all when dental student Dick Davidson went climbing nearby and dislodged a few tons of talus that skittered down the cliff and went THUD about fifty yards from camp. After that we all squeezed our sleeping bags back under protruding ledges in search



Above: Judy Jud, wife of the Outing Club president, enjoys a cold plunge in the crystal-clear waters of the Colorado River. Below: Club members shove their heavily-laden rubber raft into the river at the start of their float trip.



of fall cover, although there was some doubt as to the preference of being crushed by a fall of the overhanging ledge over being done in by a smaller but faster stone dropping from the canyon rim.

Nothing happened during the night, however, although we did have some visitors who left their tracks in the sand. Several lizards, a racoon, a fox, some mice, and a snake had inspected our quarters in the dark.

One nicety of guided travel is that the guide prepares the meals and cares for the equipment. John Cross was an exceptionally good cook. Our larder was full of steaks, chickens, and other good things for the first three days; then the ice ran out. John was up early that morning making pancakes and eggs. We ate all we could hold, packed, and shoved off again.

The Colorado River has some peculiar man-made tides. During times when much electricity is needed, the Glen Canyon Dam a few miles upstream from Lee's Ferry lets out a great deal of water. At other times the flow is curtailed. This produces a rise and fall in the river level, and the effect is noticed at different times because of the lag time of flowage as one travels downstream.

ONE GREAT CONVENIENCE about floating the Colorado is that the river water is potable. There are no big cities or other pollution sources nearby to foul the water and the normal sand and silt load is settled out behind the Glen Canyon Dam. The water on which we floated was cold, clear, and pure almost to the end of the trip.

At mid-morning of the third day, we stopped on a broad gravel bar to visit Indian ruins. These structures were a series of storage houses built of stones and mud. They were in a re-entrant at the base of a sandstone cliff just above the top of the talus cone. From the raft to the ruins was at least a mile walk, much of this up a 45-degree slope through cactus. We wondered why anyone would have spent the energy necessary to construct the houses in so remote a site. The labor of carrying the mud alone must have been prodigious. We finally decided that these structures must have been erected during wetter times when the water was at hand on the cliffs.

That evening about midnight Joan Jackson, the wife of a psychology student, noticed a scratching sound in the bushes and rolled over to come nose to nose with a wandering rattlesnake out hunting his evening meal. The bedlam that followed could have been mistaken for the Arizona State Championship Sack Race. Joan yelled and jumped up, awakening the other campers, all in sleeping bags and all trying to get away as fast as possible. Someone grabbed a flashlight and John ran over with a stick to catch the snake. In the confusion, the person holding the light kept shining the beam away while John was grabbing for the snake in a bush, which made the chase much more exciting. The rattler was eventually caught and disposed of.

Another member of the reptile family did make good company. In contrast to rattlesnakes, chuckwalla lizards are entertaining. These creatures have an air sack on each side of their backbone and, when aroused, will

lumber up a crevice and inflate the sacks, thus becoming firmly wedged in the hole. Indians catch these lizards by puncturing them with sharp sticks and pulling them out of their hiding places. But Jerry Cross, the head guide's brother, captured one without resorting to a sharp stick, secured the lizard by a string harness, and let him run in the raft. My wife, Judy, provided a perch for old "Chuck" on the top of her straw hat. Come rapids or waterfalls he stayed on his perch all day, becoming the best traveled lizard in the canyon.

On the fourth day, part of our group packed out of the canyon by mule train. As they disappeared up the canyon, we got back on the river and ran a rapids—a *BIG* rapids. Hermit Rapids was probably the high point of the trip for most of our party. As it is approached from upstream Hermit looks identical to most of the other fast water areas on the Colorado, but it is a tiger in hiding.

On the first big wave the river plummeted about ten feet and we slid smoothly down like a greased pig. The raft kept gaining momentum from the fall and the fast water. It raced up the side of the next wave with such velocity that the bow third of the raft leaped out of the water. I sneaked a fast look over the side and saw wave bottom twenty feet below! The bow reversed its climb and fell all the way to the wave trough, leaving us feeling as if we had taken the season's first jump off the high diving board. As the bow slammed down, the rear flipped over the wave crest and rose a good ten feet over my head. The raft unbuckled and shot up the next wave, tossing two members of the expedition through the air. One landed in a heap on the raft floor and the other managed to remain on his feet, but was bounced all over the bow. On the next wave the front of the raft vanished momentarily from the rearward passengers' sight as the raft bent double on the crest. Fortunately these waves were just big, not rough. Although everyone got tossed about and dropped twenty feet several times, there were no injuries because the water was deep and smooth.

After Hermit Rapids came Boucher, Crystal, Tuna Creek, Agate Creek, and Turquoise Rapids, all major stretches of white water. Camp that evening was on a sand bar beside Ruby Rapids.

The next day we explored Havasu Canyon, which has perfectly clear blue water. Big fish swim over the gravel and can be seen easily from a vantage point on the cliffs. Judy and I swam upstream to the base of a small falls and spent a couple of hours swimming, taking pictures, and getting a good case of sunburn.

About two hours downstream from Havasu was Lava Falls Rapids. Large jagged lava boulders clogged the way and we could easily have been wrecked had it not been for John's skill in handling the raft.

Below Lava Falls the river banks and uplands were solidly mantled with somber black lava flows. A lava flow had dammed the river and created the falls. Lava often cracks into distinctive polygonal columns as it cools from the molten state. This canyon lava was fractured in unusual and intricate patterns that traced the old thermal gradients in the cooling rock. Where most lava columns

run vertically, these columns often curved up to 90 degrees to intersect a fissure. The effect is that of a gigantic spaghetti pile, bent, but oriented internally.

Farther downstream is Travertine Canyon and Grottos. Here, a hot spring completely filled a small canyon in the recent past and then died. The native rock boulders of mostly red hue are now encased in pure white tufa from the spring. After the spring died, the original canyon stream returned to work and cut under the tufa along the old canyon floor, creating an elfin grotto. We walked along this stream, standing on the pre-Cambrian rock and surrounded by the white hot spring rock, until the cave ended at an incoming waterfall. Algae made this steep fall face difficult to climb so we stopped there to soak in the beauty of the little cave. Outside the cave runs a band of mica schist loaded with well-crystallized garnets of about bean size. It reminded one of the dwarfs' jewel mine in Disney's "Snow White."

THE LAST TWO DAYS of the trip were slow. Near Lake Meade the effect of man can be noticed for the first time. A few feet above the river is a brown line of mud—the watermark of Lake Meade when it stood full several years ago. The banks are no longer clean, clear sand bars. They are now made of silt and choked with low bushes which nearly prohibit camping. There are no good rapids left—presumably the silt has filled them too.

The canyon ended abruptly on the tenth day. Within half a mile the walls fell back to leave us on a rolling desert. Looking back, one could see the narrow slot through which we had been rafting, with tall cliffs stretching thirty miles on both sides.

Slowing of the river's flow at the lake headwaters has caused vast quantities of sand and silt to be deposited. The channel became nonexistent and we were forced to sound our way in water only a few feet deep.

In due course we passed the mud flats and entered deeper lake water. We camped within sight of the trip's end point, Temple Bar. The insects were ferocious. Until now bugs had been no problem, but on the lake they arrived in force. Gnat swarms two feet in diameter bobbed up and down like a ballet of basketballs.

There were also numerous tumbleweeds—thorny bushes, unpleasant to touch or to have roll across one's sleeping bag. To protect ourselves from stampeding tumbleweeds, we set fire to about an acre of them piled high by the wind. The resinous wood burned quickly with a soot flame not unlike the burning of a pile of old tires.

The final day was short. We had only ten miles of lake to cover. While we floated down the lake to Temple Bar, we brought back to mind the highlights of the trip: Joan's encounter with the gregarious rattler; the charming small spring we saw in the hot spring deposits near the Travertine Falls; the herds of wild burros, reminders of the old-time prospectors who no longer roam the West; swimming in the cold, clear river; the lava field near Elves Chasm; all those chuckwalla lizards; and, most of all, the exciting rapids we had traveled.

THE NUMBER OF Nobel Prize winners an institution can claim has come to be regarded as an important measure of academic standing. Unfortunately, there is no general agreement on just what constitutes the ground rules for a claim. Some institutions are most scrupulous, but it is said that a few will claim a Nobel laureate if the man ever walked across the campus.

The lead article in the November, 1967, *Scientific American* discusses "The Sociology of the Nobel Prize" and attempts to tabulate Nobel Prize winners by institutions. The author, Dr. Harriet Zuckerman, project director of the Bureau of Applied Social Research at Columbia University, matched laureates and institutions in four ways: where the scientist received his doctoral degree, where he did his prize-winning work, where he was when he received the prize, and where he is currently affiliated.

Based on these criteria, the top ten American institutions, in terms of Nobel Prizes, are: Harvard, Columbia, California at Berkeley, Chicago, Cal Tech, Princeton, Washington University, Johns Hopkins, the Bell Telephone Laboratories, and Stanford.

In ranking Washington University seventh, the article credits the University with six Nobel laureates: Carl and Gerty Cori, Arthur Holly Compton, Joseph Erlanger, Herbert S. Gasser, and Arthur Kornberg. All six did their prize-winning work at Washington University, three were at the University at the time of their awards, and one, Dr. Carl Cori, is still on the staff.

Actually, we can lay some claim to a total of eight Nobel Prize winners. Dr. Severo Ochoa, who shared his prize with Dr. Kornberg, was on the University's staff for several years. Laureate Edward Doisy served for a time on the Washington University faculty, although most of his prize-winning work was done at St. Louis University. If we could count these last two, we would move up from seventh to fourth place on *Scientific American's* list. Still, seventh place isn't bad.

ONE OF WASHINGTON UNIVERSITY'S Nobel laureates has just recently won new acclaim for what is being hailed as one of the great landmarks of research in the life sciences. Dr. Kornberg and his colleague, Dr. Nehran Goulian, working at Stanford University, have succeeded in producing artificially in the laboratory the active, infectious core of a virus. In the words of *The New York Times*, "The achievement seems close to the laboratory production of life itself . . . the active virus core material produced is DNA, the master chemical of all life and the substance that determines the heredity of every living thing." Dr. Kornberg will be the principal speaker at the University's 1968 Founders Day banquet on March 2.

BEFORE THE HISTORIC Kornberg-Goulian achievement, biologically active nucleic acid had been synthesized

in the laboratory in the form of RNA, a more simple form of virus core material. The researcher who performed that feat was another former Washington University faculty member, Dr. Sol Spiegelman of the University of Illinois, who received his Ph.D. from Washington University.

WHILE ON THE subject of Washington University Nobel laureates, we are happy to call attention to the recent publication of a new volume of the selected papers of Arthur Holly Compton. Released this fall by Alfred A. Knopf, the new book contains forty-five papers, many of them previously unpublished. Under the title *The Cosmos of Arthur Holly Compton*, the collection gathers in one volume Dr. Compton's observations on a wide range of both scientific and humanistic subjects. The volume was edited by Marjorie Johnston of the University's publications staff and includes an introduction by Vannevar Bush and a collection of previously unpublished personal reminiscences of Dr. Compton's.

THE EDITORS OF this magazine have received several comments from readers about our somewhat unorthodox orthography in the article "New Approach to Communication Disorders" in the summer issue. The first to comment was alumnus Bill Vaughan, the *Kansas City Star's* widely syndicated humorist. Bill's note was brief and to the point:

"Good piece on Dr. Ogura, but does WU's world-famed medical school really think that 'chord,' as in 'vocal chord' is really spelled with a 'h'?"

We hope our answer to Mr. Vaughan will satisfy any other readers entertaining the same question:

"Your letter struck a responsive cord—the Lost Cord, in fact.

"We have plenty of excuses. Just pick the best two out of three.

"1. The 'chord' spelling can be found in the *American Illustrated Medical Dictionary* (if you look long enough). *The Random House Dictionary of the English Language* gives 'chord' as a rather remote second choice, as does the Second Edition of *Webster's Unabridged*. The Third Edition of *Webster's* doesn't care how you spell it.

"2. You are confusing the word with 'Cord,' a very fine front-wheel-drive automobile produced by the Auburn Company in the thirties.

"3. The people who put out this magazine simply goofed. A team of highly skilled editors read copy, galley proof, and page proof on the article, but it took Bill Vaughan to point out that there is no 'h' in 'cord.'

"Well, we hope we're in accord on this.

Chordially,
The Editors"



FRATERNITY FORUM: For three days in November, the University's fraternity system brought to the campus a group of leading figures from education, business, communications, and government to discuss in depth the topic "Man Against Himself?" Above, keynote speaker Eric Fromm, who also met informally with the students; right, Graham Chapel filled to capacity for Fromm's major address.

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