Having paid its respects to Shakespeare's 400th birthday earlier in the year, the University last fall turned its attention to a quadiicentennial of at least equal importance: the birth of Galileo. Rather than merely reviewing the achievements of the founder of modern science, Rochester's Galileo Quadricentennial sought to "re-examine the way in which knowledge has been sought and the implications of the role of science in modern society." Participating in the three-day series of seminars were some fifty distinguished scholars and scientists from all parts of the country.

From the several papers given during the two-day program the Review presents some excerpts from the Convocation address by Professor Gilberto Bernardini and a slightly abridged version of Philip Abelson's thoughtful and—to some—disturbing discussion of science and government. Coincidentally, some of the problems touched on in the latter paper are discussed—from somewhat different points of view—in Professor Marshak's article, which appeared in The New York Times shortly after the Quadricentennial, and in C. R. Weston's article on the search for life on Mars. As readers will note from the item on Page 27, comments on these articles are invited.
Usualy our conception of a great man of the past is largely influenced by the historical development which links our ways of being and thinking to him. Surely we can say that these links are made stronger and deeper, the greater his impact on the historical development of civilization; thus it becomes more difficult for us to establish an objective perspective on his personality that may do full justice to his intellectual and moral stature.

Actually, this interaction between him and us follows some more or less general laws: on the one hand—not very differently from our ancestors who created legends and myths—we like to see in great men of the past the symbols of some perennial ideals of mankind; on the other, the achievements of these men-gods usually still influence our daily life so substantially that it is difficult, if not impossible, for us to measure their original intrinsic values.

These laws of historical distortion—unavoidable and irreducible as they are—operate particularly where Galileo is concerned. His dramatic life was quickly framed by legend, but at the same time his fundamental works on mechanics were rapidly diluted by the vigorous growth of this science of which he was indeed the founder. His language, intentionally addressed to anybody capable of thinking, his warm call to faith in human reason and in the power of human knowledge, became, through the centuries, the banner of intellectual freedom; but at the same time, it is very hard for us to realize that this language is largely our own language of today, that this faith, daily supported by countless observable facts and by our understanding of them, is a matter of common consent.

Furthermore, his birth, which the University of Rochester has so solemnly celebrated, occurred at a time which can be considered particularly favorable to his spiritual features, to his intellectual eagerness and fervour. It occurred when, on the fertile ground prepared by the Renaissance, the attacks against Aristotelian Physics, the new individualistic approach to the Bible and Christian doctrine, and Columbus's Atlantic venture were dismantling—on behalf of a new sense of human dignity—the medieval certainty of a fully organized and accomplished world, buttressed by theological and metaphysical principles often tainted with superstition. It is not mere chance that his life spanned the dawn of the Scientific Revolution. Contemporary of Descartes and Kepler, Galileo represents in this triangle the vertex from which the New Philosophy sprang more vehemently and with vast consequences.

* * *

Galileo is often called the “Father of Physics;” less frequently, the “first modern physicist.” One may notice
the subtle difference between these two. I think, however, that they are quite appropriate in characterizing Galileo's historical significance. He was the Father of Physics because of the revolutionary trend of his natural philosophy; he is the first modern physicist because he went from the phenomena spontaneously offered by nature and considered with common sense (for instance, the slow swinging of the pendant lamp or the too-quickly-falling bodies) to quantitative experiments made by constructed pendula or the tilted plane, where, respectively, the length of the lamp or the acceleration of the body was made large or small at will. He is the first physicist, not because his name is bound to discoveries comparable to the law of gravitation... but because he first expressed the results of systematic observations in mathematical terms and stated that one should try the simplest assumptions in guessing how to describe a new phenomenon with mathematical language. He was the Father of Physics because, with concrete wisdom and conscious intellectual humility, he approached the immensity of nature with these words: "It always seems to me extreme rashness on the part of some when they want to make human abilities the measure of what nature can do. On the contrary, there is not a single effect in nature, even the least that exists, such that the most ingenious theorists can arrive at a complete understanding of it. This vain presumption of understanding everything can have no other basis than never understanding anything."

It is of very limited interest to know whether or not Galileo bought his first telescope from a Dutch merchant. But it seems to me essential to know that, having in some way a telescope in his hands, after weeks of observation—repeated over and over to check the power and reliability of the instrument in magnifying terrestrial objects far away—he raised it towards the sky with absolute faith in the keenness of his senses mediated and enhanced by an instrument contrived by man. The essential point is that—by doing so and discovering mountains on the moon, spots on the sun, the satellites of Jupiter, and many new stars never seen before—he proved by his eager desire for knowledge, by the unprejudiced use of his intellect, that he had more faith in his instrument than in the mystical perfection of the sky.

It is certain that, before Galileo, instruments and machines were used only to increase the efficiency of human and animal labor, while, after him, machines and instruments became the means to hew down the fence that kept within extremely narrow limits man's perception of the world.

Today, thanks to optical or radar telescopes, we "see" things that are extremely far away from us; electronic devices and instruments allow us to "see" a virus or to follow the track of an electron; we "hear" sound signals emitted by a bee or a bat; we measure time with electronic or atomic clocks; we know when and where a single photon has been absorbed.

One may argue that "technical" development was more or less on the way and that in this sense Galileo was only the most eminent man of his time. This is certainly true; however, there is a fact that distinguishes him from all the others and that is unrelated to any scientific achievement. The Sidereus Nuncius—in which his main astronomical discoveries are condensed—is practically his last work written in Latin, the language of the scholars of his time. Ever after, he wrote in the vulgar tongue, so as to enlarge his audience and to be followed not only by scholars, but by all people able to think for themselves....

The Sidereus Nuncius was published on March 12, 1610. In September, he moved from Padua to Florence (where) besides receiving an elegant title and a salary comparable with that of an American Nobel Prize, he had no obligations with respect to teaching and residence....

Free from all duties, well settled economically, instead of writing the long-conceived book on mechanics, instead of extending his explorations of the sky, he started what we may call, in modern language, a political campaign in defense of a new society potentially free from any prejudice and oriented towards irreversible progress.... In this respect, the battle to defend the Copernican system goes far beyond the struggle in favor of an idea thought to be right. It is the expression of a faith, the faith of a free human reason having the right and the power to fight perennially against fictitious dogma and intellectual and moral idleness. This seems to me the greatest legacy of Galileo. In this respect, he is the first man of the "enlightenment."
Galileo's contributions were not only in the discoveries he made but, equally, in his procedures in making them and in later working for their acceptance. In effect, Galileo discovered science. He demonstrated that a fruitful scientific investigation starts with a conflict between preconceived notions and a new experience, followed by a critical, searching analysis and the devising of crucial experiments. Once new insights were gained, Galileo was willing to engage in polemical exchanges to gain acceptance of his findings. Essential to his approach was a disregard, even a defiance, of human authority and established dogma. In this attitude Galileo overcame a deep-rooted human tendency. Nearly all human beings are mentally lazy. When a difficult problem arises we may worry at it for a while, but we sooner or later abandon the effort and are pleased to fall back on the dicta of an authority on the subject. Most men spend their lives learning and parroting the dogmas of their time. The greatness of civilization today rests on the fact that rare venturesome souls like Galileo were capable of rising above the usual pattern.

In the centuries before Galileo's time, human thought was largely dominated by dogma and authority. In the last several hundred years science and authority have been in conflict. The methods of science have been so powerful and creative that authority and dogma have often been forced to retreat. Nevertheless, the battle is one that science can never finally win. The deep seated habits of mental laziness are too universal. The overwhelming majority wish to be told what to think.

In this conflict of science and authority, how goes the battle today? A casual examination would suggest that it goes well. The number of people called scientists has been increasing rapidly; their prestige is high. Indeed, a recent study has shown that the public accords a higher standing...
to scientists than to state governors or congressmen. At the same time scientific research is being subsidized on an unprecedented scale. Men trained in science are occupying important positions in government and in industry. During the past decade the conflict between science and authority has seemingly diminished. Authority has accepted research and development as desirable activities. In turn, large segments of science have joined the establishment. On the surface the relationship appears relatively sound. A deeper look presents a view that is not so reassuring.

The authority of the federal government has so risen that government has power transcending that of any other segment of society. Its power is growing and seems destined to continue to do so. At the same time the financial needs of science have been increasing. To obtain new knowledge requires expensive facilities, which are mainly financed by the government. Owing to financial dependence the fate of the burgeoning scientific establishment rests largely with the politicians.

The essence of science is foreign to politicians. By nature and by education they tend to be authoritarians. Most of them are trained as lawyers, whose basic approach is to honor precedent. In their approach to problems, politicians practice the "art of the possible." When truth is useful it is employed. But when truth gets in the way it may be edited. Moreover, in a democracy politicians must give great weight to the views of the majority. Now it is a characteristic of science that progress is dependent on disregarding the views of even an overwhelming majority. At the time a new insight is gained the discoverer is in fact a minority of one.

Congressional committees are willing to listen to scientists, and on occasion they invite scientific testimony. When they do so, however, they give real attention only to so-called authorities. I recall a Congressional hearing involving a group of competent scientists whose lead-off witness was Edward Teller. While Teller testified, the full membership of the Congressional committee listened and a large contingent of the press busily took notes. When he finished, almost all the Congressmen and the press departed. The remaining scientists had carefully prepared for their presentations, and their testimony was as important as Teller's. But, as far as affecting events was concerned, the group was wasting its time.

In relating this incident, I am not seeking to criticize but rather to point out a reality. Most of us, if cast in the role of Congressmen, would very likely act in much the same way. Faced with puzzling problems whose fundamentals we do not comprehend, we instinctively turn to authority. There literally is not time to acquire the knowledge and experience to deal at first hand with multiple complexities.

In considering the health of science and its relation to the federal government, another reality should be recognized. Much of the public does not fully understand what science is all about. Politicians recognize that with knowledge comes a by-product, namely, power—power to control and change the environment, power to produce all manner of wealth, military power. They are impressed by these facets of power, but few seem interested in knowledge for itself. The present status of science stems from the effectiveness of hardware that resulted from scientific knowledge.

To an important degree the present affluence of science dates crucially from about twenty years ago. Many of the enterprises leading to great military developments during World War II were based on research at universities: for instance, the development of radar techniques in the Radiation Laboratory at MIT, the participation in atomic bomb work by Columbia University and the universities of California and Chicago, proximity fuse work by Johns Hopkins University, and rocket propulsion at California Institute of Technology. These fundamental programs contributed crucial technological advances and were decisive in giving the nation advantages in weapons capabilities. The atomic bomb came late in the war and actually had less effect on the course of the conflict than some of the other developments. But the detonation at Hiroshima was so dramatic as to leave with the average man a profound impression of the power of science. All too soon the cold war began, and with it came the fear that an enemy might make important discoveries faster than we. Later, Sputnik intensified these fears. The stage was set for large-scale federal support of scientific research in this country. Congress also came to realize that important technological developments often rest on basic research and new knowledge. But to them research has been principally a tool with which to achieve an end. Usually when politicians speak of scientific research they mean research in connection with development. For the most part the two words are coupled, and usually they are regarded as inseparable.

When politicians support research they do so in the expectation that they are buying gadgets. When research
has no obvious connection with development it can become a target for criticism.

Recent events suggest that a further evolution of the relation of Congress and science is under way. Research and development funds are likely to become a great new pork barrel. ... It should not be astonishing that such a tendency should appear. Perhaps the amazing fact is that research and development was not made a pork barrel earlier.

A key factor in the changing Congressional attitude has been the influence of members of the Joint Committee on Atomic Energy. In a recent article in Science, Senator Anderson expressed some of the attitudes of a veteran influential member of the Joint Committee:

"In the last analysis it is the collective wisdom of Congress itself which counts most in making important decisions. No decisions can be made in isolation, on a completely scientific basis, by disinterested officials. Congress will consider the scientific aspects of a proposal and pay attention to the facts assembled by the engineer. But in addition, Congressmen must ask some further questions: What will the impact be on our economy? What effect will the proposal have on our foreign relations? Will it contribute to the health and welfare of the nation?"

"There are numerous examples from the area of atomic energy when Congress spurred momentous decisions, in the face of inconclusive advice from experts, which have withstood the challenge of history and have proved right."

In a recent speech another member of the Joint Committee, Representative Price, went further. ... In this speech he outlined "some of the principles which I believe Congress should establish during this period of very careful reexamination of federal research and development activities. The points of concern to Congress will include: establishment of clear cut objectives for research and development projects ... a realistic cost estimate for the entire project, not just the immediate year ... centralized responsibility and continuity of management ... a plan to follow through; to put the results of research and development to actual use."

Congressman Price also pointed to high-energy physics as an area that might be subjected to the examination he had outlined. Mr. Price's four major points are applicable to many activities supported by the government, such as development of weapons or most of the space program. They also seem applicable to research carried out in connection with such development work. High-energy physics, however, though costly, is in another category. The magnitude of the funds required, of course, makes some planning essential but how can a cost estimate be made for the discovery of a particle that hasn't been discovered yet? If these principles are to be applied to high-energy physics, are they not also applicable elsewhere? Should the biologists be required to estimate the cost of completely elucidating the genetic code or of identifying the chain of electron donors and acceptors in photosynthesis? If the precedent of Congressional planning of research were established, the practice might be carried to ridiculous lengths. I am loath to believe that this will happen soon, but the possibility of restrictive Congressional controls cannot be dismissed.

In a few research projects, such as in high-energy physics, Congressional committees may become closely involved. But, for the most part, controls are likely to be applied through the granting agencies, which of necessity are closely attuned to the wishes of Congress. These agencies are mainly staffed by men who have been trained in science and find themselves in a difficult role.
They are at the interface of two different worlds, and neither world fully trusts or honors them. As the science administrators have considerable voice in policies and in determining who is supported, it is desirable to understand their backgrounds and attitudes toward creative science.

To understand the mature scientist, let us consider his development. After embryonic scientists have become deeply committed they often find that research is not so easy as it is advertised to be. Very few scientists have an instinct for crucial experiments. Most scientists when engaged in research spend many of their hours in frustration. A creative scientist must be able to absorb almost endless punishment in order to achieve even minor insights. Even so, the competition is keen. To avoid being outdistanced, a scientist must be single-minded in his devotion to research and to the necessary reading of scientific journals. Small wonder that many give up the effort. Some who do so find opportunities in the administration of research.

After a man becomes a full-time administrator he is likely to be most comfortable with other administrators and politicians. The sympathies of the scientist-administrators lie with the research workers and they conscientiously try to defend basic research against inroads by politicians. However, very soon after a man ceases to be active in creative work his real contact with science atrophies. The conversation of the typical Washington science administrator revolves around the politics of science; rarely does it touch the content of science. Moreover, Congress and the Administration are on the scene and make their presence felt in many ways. The creative scientist is far away and immersed in his work.

The administrators attempt to broaden their base in science by consulting advisory committees. At the higher levels, however, committee members are often only nominally connected with creative science.

As an aftermath of the first Sputnik, succeeding presidents have leaned on presidential science advisors, who at times have wielded a good deal of influence while in turn drawing on the advice of a rather narrow group of scientist authorities. When problems arise in other parts of the federal establishment special advisory panels are assembled. These too consist of authorities. In the multiplicity of committees there is a tendency to employ a limited group of experts, so that the same people appear again and again. This oligarchy is at least as closely attuned to the art of the possible as to the search for truth. At its interface with politics, science is often a servant of authoritarianism.

I have served on a number of advisory committees and have noted considerable variability in their performance, depending on the type of problem under consideration. I have seen superb performance and many new ideas arising from committees considering technical problems. This occurred when the fund of knowledge made available by briefings and already resident in the group was sufficient to permit questions to be answered on a creative scientific basis. All too often, however, committees are asked to furnish judgments either in areas in which they are not fully competent or in areas in which no one answer is very good.

As long as committees are discussing scientific facts or hypotheses they tend to behave objectively and democratically. When imponderables are considered, the atmosphere is more authoritarian. One or two of the more influential members tend to dominate the decisions.

Advisory groups seem most at sea when asked to consider how much money should be devoted to a given area of science—for example, high-energy physics. I sat on such a committee. A variety of approaches was employed. As a warmup exercise, the group considered how big a machine might be constructed if the entire gross national product were devoted to it. The committee settled down to a long period of trying to guess how much money Congress might be induced to spend. Had this number been ascertainable, the committee could have decided very quickly how much to recommend.

Washington and science administration have a strong fascination to out-of-town scientists. Almost any scientist will drop what he is doing to go to Washington to sit on a committee. This willingness is often exploited. If a federal agency has a problem that seems too hot to handle, arrangements can be made to recruit a committee of distinguished bagholders. With proper selection, a

Continued on page 24
The scientific race between Russia and the United States, which began seven years ago with the launching of Sputnik I, has reached a curiously ironic point.

If we distinguish between pure science or basic research and applied science or technological development, we find that the United States is doing exceedingly well in basic science. In fact, the Soviet Union is attempting to duplicate many of the conditions of scientific freedom which are responsible for the superior American performance. If this attempt succeeds, Russian pure science will become intensely competitive with ours, and the very nature of this success should lead to a substantial loosening up and freeing of Soviet society on many fronts—a result we could only applaud.

On the other hand, in applied science the U.S.S.R. has demonstrated its capability of organizing large team undertakings whose favorable outcome depends as much on careful mobilization of material and human resources as on scientific brain power. Here, Russian achievements have been sufficiently impressive to call for a rethinking of the methods we use to define and attain our national objectives in applied science and technology. If we move in the direction of greater coordination and control in the area of applied science, we shall be taking a leaf from the Russian book. This statement may upset many Americans, but it follows logically from an appraisal of the strengths and weaknesses of American and Soviet efforts in science and technology.

Let us begin our appraisal by comparing the present state of pure science in the United States with its Soviet counterpart. Since the launching of Sputnik I (a new reference point), seven sets of Nobel Prizes have been awarded for research in physics, chemistry and medicine. Of these 21 prizes, 10 have been won either in whole or in part by Americans and two by Russians. If the Nobel Prizes are any measure of achievement, the United States is far in the lead.

By any other standards, American accomplishments in pure science since the end of World War II have been much more impressive than Russian or any other national efforts and have been so recognized throughout the world. American discoveries in pure science range from outstanding accomplishments in high-energy and solid-state physics to spec-
tacular breakthroughs in genetics, biochemistry and medicine. In some of these fields, such as genetics and biochemistry, Russian work today is still quite poor; indeed, only in mathematics and theoretical physics is Russian research in any way comparable in quality to similar American research.

The striking American performance in pure science in recent years results from a combination of fortunate circumstances. A primary factor is that the openness, freedom and emphasis on individual initiative that characterize the American way of life provide a favorable climate for the practice of pure science. It is a truism that the worker in pure science may make revolutionary discoveries of the greatest practical application. But the point is that the pure scientist must be completely free to choose the subject of his investigations and to draw the conclusions to which they lead without the caprices of some nonscientific authority. The diversity of American science stems from the extraordinary degree to which the individual researcher is allowed to follow the bent of his own curiosity and the creative impulses of his own mind.

In contrast, practical utility, external constraint and central direction marked, until recently, the Soviet approach to pure research. Scientists who have visited the U.S.S.R. have found that much of the scientific work there has been "overplanned" and too closely geared to the state's economic needs. This has led to uninspired work in many areas of research and to a waste of manpower because so many persons in the higher echelons have been engaged in planning for the lower echelons of scientists.

But there are indications that the situation is changing. It is reported that Soviet scientists, in the many up-to-date laboratories at the new scientific center in Novosibirsk are breaking away from the hierarchical organization of the older laboratories. If this spirit spreads, the atmosphere in the Soviet Union will be more conducive to fresh and daring work in pure science.

The development of pure science also requires openness of communication. The scientist should be free to publish results, to receive publications from colleagues in other countries, and to have personal contact with all the experts in his field. Here again, the Soviet scientist has not fared as well as his American colleague. The Soviet researcher is now permitted to publish his scientific results and receive the voluminous Western scientific literature, but there is still no guarantee that even the most distinguished Soviet scientist will be permitted to attend an international conference in a foreign country.

The Soviet Government has been slow to recognize that no amount of familiarity with the scientific literature can replace the intellectual excitement generated by the personal exchange of ideas. Many jokes have been made about the presence of so many American scientists at international gatherings, but the fact remains that such participation in conferences and other types of personal association has brought our science to a high degree of alertness and sophistication.

A second reason for the outstanding performance of American science is that pure science in this country is performed largely in university laboratories where the senior scientists pass on the torch to the young students and where the students, through their enthusiasm and inventiveness, help to break down traditional patterns of thought. By combining graduate teaching and research at a single institution, as we do in an American university, we expose our young people to exciting new ideas and the most modern research techniques.

In the U.S.S.R. the bulk of the basic scientific research has been concentrated in the specialized institutes of the Soviet Academy of Sciences, not in the universities, which play primarily a pedagogical role. In the academy institutes, there is a reluctance to accept young students because supposedly they will interfere with the research activity of the senior scientist. (In contrast, in the United States, many programs are planned so that graduate students will receive the maximum benefit from up-to-date equipment and contribute significantly to the research.)

Now the scientific leadership in the Soviet Union, aware of the wisdom of the American approach, has undertaken to upgrade the research work in Russian universities and to break down the barriers between them and the academy institutes. Again Novosibirsk may be cited, for many of the scientists at the new academy institutes there are also deeply involved in the new university.

Again the United States has been wise, whether through foresight or chance, to distribute its important scientific centers widely throughout the country. This dispersal should be carried further: in the South, for example, and in some of the Western states.

In comparison, the Soviet Union has only recently recognized that its research is centralized in too few centers, such as Moscow and Leningrad, and that a major effort toward decentralization is needed. Besides Novosibirsk, Erivan in Armenia and Tiflis in Georgia are examples of the decentralization process that is now

being carried further in other republics of the Soviet Union.

A third major component of the American success story in basic science has been our hospitality to foreign scientists. Those we have welcomed to our shores—from Hitler’s Germany, from Mussolini’s Italy, and from other countries where political repression or public apathy discouraged scientists—have fully justified our confidence by contributing in an essential way to the achievements of pure science in the United States.

Approximately 25 per cent of the 697 members of the National Academy of Sciences in the United States are foreign-born; and this percentage underestimates the influence of our naturalized scientists because many of the native-born members of the National Academy of Sciences were trained by their foreign-born colleagues. Some of these foreign scientists might have emigrated to the Soviet Union if the Stalin purges of the mid-nineteen-thirties had not demonstrated that foreigners were not welcome in the U.S.S.R. Some Soviet scientists now regret this short-sightedness and point out, quite correctly, that a hundred Bruno Pontecorvos would have made a tremendous difference for pure science in the U.S.S.R.

A fourth important factor in American basic research is the high level of our industrial technology. In many cases the design of major pieces of equipment, even large installations, is carried out at university laboratories, and once the design is completed, it is possible to obtain from American factories, within a reasonable time, component parts satisfying very difficult and refined specifications. This has not been the case until recently in the Soviet Union, with the result that comparable installations and major items of equipment there are not as well constructed as in the United States.

It is therefore not surprising that the research output from a laboratory in the United States is as a rule substantially greater than from its counterpart in the Soviet Union. A good example is to be found in the field of high-energy nuclear physics. Not only is the research output of the 30-BEV (a BEV is one billion electron volts) accelerator at the Brookhaven National Laboratory much greater than that of the 10-BEV machine at Dubna in the U.S.S.R., but so is that of the 6-BEV unit at the University of California. It remains to be seen whether the 70-BEV high-energy accelerator now under construction in the Soviet Union will reverse this situation. There are some indications that it may.

Finally, we come to one of the most important reasons for the impressive American performance. Even if all the other conditions for successful scientific work exist, the results may still be unimpressive unless funds are available for the costly and elaborate equipment and technical support required in modern research. It has been our good fortune that the Federal Government has seen fit, at least until now, to provide strong financial support for basic research carried on at the universities, without infringing on the independence and freedom of the individual scientist.

The many scientific contributions to the winning of World War II—the atomic bomb, radar, the proximity fuse, and so on—led to a willingness on the part of the American public and Congress to support basic research. It was recognized that funds for pure science would be the “seed money” for American technology, economic development and military security, and, after the war, a large number of Federal agencies soon began to support basic research at the universities. After Sputnik I was fired in 1957, Federal support of basic research increased rapidly until its present annual level is about $1.5 billion or approximately one-quarter of 1 per cent of the gross national product.

On the Soviet side, it has been apparent for some time that lavish provision is made for laboratories and equipment, that high educational standards are maintained and that no effort is spared to attract the most talented persons into scientific fields. But what has been lacking until recently has been the realization that pure science can flourish only when there is an absence of external compulsion.

It is now clear that the U.S.S.R. has learned some important lessons from the American experience and is attempting to develop a more favorable environment for basic science. If these efforts are even moderately successful, there should be a great improvement in the quality of the Russian work. The only way to prevent serious damage to the American standing in pure science is to continue the generous Federal support of basic research in this country.

The picture in applied science is more confused. It is evident that American technology is more versatile, more elegant and of higher over-all quality than Russian technology. We can produce better cars, better TV sets and better electronic equipment. But there is the more serious question: Can we overcome Russian superiority in rocket technology, continue to match Soviet achievements in thermonuclear fusion and maintain our relative position in the nuclear-missile fields so essential to our national security?

These are major national goals of the Soviet Union which have been pursued with an amazing singlemindedness. Russian successes in these fields have demonstrated that the governmental control and central direction characterizing the Soviet way of life can be effective in achieving certain well-defined technological objectives of the nation.

We must reckon with other national goals in applied science and technology which the Russians have set for themselves during the next decade: electrification of the entire country, comprehensive mechanization and auto-
mation of production, direct conversion of thermal, nuclear, chemical and solar energy into electric power, and so on.

The Soviet master plan will be expedited by official councils of scientists, engineers and industrial leaders; it will be promoted by the press, scientific and engineering societies and prize competitions, and implemented by a new State Committee on the Coordination of Research and Development. This concentration on applied science and technology constitutes a huge challenge and is bound to lead to additional breakthroughs in areas where the Soviet state has focused its attention.

Past Soviet achievements and the potential for greater technological achievements in the future have placed us, in the United States, in a genuine dilemma. Somehow, we must reconcile the freedom and emphasis on individual initiative, which make for a superior performance in pure science, with some of the coordination and control required for success in grand-scale undertakings in applied science such as the man-on-the-moon project.

The Russian experience teaches us that, once the basic knowledge exists and a practical goal has been established, teamwork and central planning are not only feasible but may even be helpful. The conclusion is inescapable that we need a greater degree of national planning in applied science, but the question remains, in what form and to what extent?

Evidently, such planning must take place on various levels. It is first necessary to establish our national objectives in applied science and technology as precisely as possible, to identify those which are of short-range importance for the national well-being and security and those which are of vital importance to our nation.

There is not only the problem of priorities; there is the Herculean task of coordinating applied research activities at the numerous industrial and Government laboratories in the United States so that the fruits of one are made available to the others. And there is also the need to eliminate wasteful duplication in the large commitments of resources and manpower required to achieve major national goals.

It seems to me these needs justify the establishment of a Department of Applied Science and Technology. Both industrial and Government scientists would play a prominent role in such a department, which would coordinate their advice, assist in the formulation of major goals and develop mechanisms for implementing them more efficiently.

In particular, a Department of Applied Science and Technology would keep a close watch on the approximately $14 billion of Federal funds that are being spent on applied science and development. This is 10 times the amount spent on basic science, and it is possible that the savings resulting from proper coordination of applied science activities would allow for a substantial increase in Federal funds available for basic research without requiring an increase in the total science budget.

An important educational job remains to be done. American scientists must patiently spell out to Congress and the American public the separate but complementary ways in which pure science and applied science and technology contribute to the national welfare and security, seeking to instill a proper appreciation of the distinct methods by which both facets of the scientific enterprise can be managed and supported. With pride in the past achievements of American science and with confidence in its future, the American people and Congress will then surely find a way to cope with the great Soviet challenge. But above all, we and the Russians must use all our heart and energy and intellect to insure that the great scientific and technological competition in which we are joined will benefit all mankind.
MARS
— A Biological Quest

by Charles Richard Weston
The tantalizing question of whether there is life on Mars was, surprisingly enough, virtually neglected until less than 100 years ago. Of course, the question was barely conceivable until Copernicus rectified the notion that the heavenly bodies rotated about the earth; but still another three and a half centuries passed before scholars seriously addressed themselves to the possibility of Martian life. It was the announcement by Giovanni Virginio Schiaparelli in 1877 of a system of canali ("grooves" or "fissures") on Mars that finally initiated widespread speculation about the nature of Mars and its inhabitants. Now, with the rapid advance of rocket technology, the speculations are about to give way to direct observations.

The National Aeronautics and Space Administration has undertaken as its major project the manned exploration of the moon; but beyond the moon, NASA's program looks to the exploration of the planets. Some of the problems and pitfalls of the biological exploration are discussed below in connection with the rationale for the program we at the University of Rochester have undertaken in Martian life detection.

It is no new observation that the rate of technological advance, and, thereby, man's scientific understanding of his universe and of himself has proceeded at an accelerating pace. Only yesterday—in terms of man's existence on the surface of this planet—Charles Darwin set forth his ideas about the origin and development of species. In the century that followed, scientists have put together a self-consistent picture of the development of life forms from simple proto-organisms, through increasingly complex forms, leading up to the mammals and Man. Nonetheless, the question "where did the first organism come from?" remains more a matter of speculation than experimentation.

In the last fifteen years experimental evidence has been adduced to demonstrate how organic chemical compounds (those we now associate with life) could have been produced abiotically in the primitive earth's atmosphere. Prior to the emergence of life, these compounds probably accumulated in the seas to form a "dilute soup." From such a mixture life must have arisen. Unfortunately, any such organic compounds produced today would immediately be consumed as food by the ubiquitous microbes; thus, we cannot on earth study the precondition of life. However, we could learn a great deal on a planet with a history similar to earth's, but which had never passed beyond the prebiological state. Mars affords just such an opportunity. Its realization awaits only the rocket to take instruments and eventually men to the surface of the red planet.

The more exciting prospect, of course, is that Mars may have its own indigenous life. If this is the case, we will have entirely independent reference points upon which to build our theories and speculations. The added perspective of an alien world would be invaluable in checking the theories which we have proposed to explain life and its workings. We may hope to learn to what extent the observed patterns of life around which we build our theories are merely accidental and apply only to earth, or to what extent they are universal and can be extended to other planets.

I wish to emphasize that the exploration for life on Mars is only a necessary first step and not the ultimate goal. The real work will begin when the presence of life has been established or its absence conclusively demonstrated. In the latter case, our interest in Mars would not diminish. The theories for the origin of life are based on assumptions which can no longer be tested on the surface of the earth because of the very prevalence of life. However, on a virgin planet it would be possible to test some of these assumptions. We could, for instance, conclusively answer the question of whether organic chemical compounds form spontaneously in the absence of life—compounds which on earth must have participated in the origin of life.

Moreover, the presence of Martian life would add a strong link to the chain of reasoning which has led some students of the problem to conclude that life is truly and literally universal, that life, and perhaps intelligent life, abounds in the universe. Such a discovery, like the concepts of Copernicus and Darwin, would provide new insights into the nature of Man.

It has been argued that the spontaneous creation of the first and most primitive living organisms involved the coordinate occurrence of so many independent events of low probability that the recurrence of such events is totally improbable. Yet, if we can demonstrate that life has evolved in the history of two planets in this solar system, it becomes almost inevitable that life will be found elsewhere in the universe.

Why should Mars have been selected for the search for extra-terrestrial life? Why not Venus or one of the other planets? The principal answer is that each of the alternates is either too hot or too cold. Only Mars has a temperature regime in any way compatible with life as we know it.

In addition, there is direct observational evidence which suggests that life might exist on Mars. Historically, the oldest and perhaps in some ways the most cogent evidence is the changing markings of Mars which have been observed as far back as two and a half centuries ago. These changes in size and color take place each Martian year at the same time that the white polar cap is

Charles Richard Weston, a research associate in space biology, is currently working with Professor Wolf Vishniac on the continuing development of the Wolf Trap. He serves as chairman of a Bioastronautics Study Group organized last fall in conjunction with the University's Space Science Center.
Some evidence of a more dubious sort has been accumulated to support the hypothesis that Mars contains not only life, but intelligent life. The most vigorous proponent of this theory was the famous American astronomer Percival Lowell. Lowell rested his arguments largely on the presence of the so-called “canals” on Mars, insisting that their only analogous structures on earth would be man-made. He presented maps showing an elaborate crisscrossing of canals with oases at the intersections running across the planet. However, subsequent investigators, although agreeing on the presence of some markings, have suggested that they are not continuous. Instead, the illusion of a line results from the association of small dark areas which blend into a line when observed from earth. Moreover, some of these markings may be natural phenomena similar to the moon’s rays.

On the other hand, some investigators believe the Martian environment is too severe for any kind of life. They cite the daily freeze-thaw cycle, the absence of oxygen in the atmosphere, high levels of radiation at the surface, and the virtual absence of water on Mars. Nevertheless, as extreme as these environmental conditions appear, each has been examined for its effect on terrestrial organisms and has been found not necessarily incompatible with life. For example, bacteria survived and even multiplied over several months when they were kept frozen 23½ hours out of every 24—i.e., thawed for only 30 minutes a day. Certainly, if even terrestrial forms survive daily freezing, Martian organisms would surely adapt to such a cycle, perhaps by evolving an internal, natural antifreeze system. The absence of oxygen, too, is not conclusive since, as bacteriologists know, many bacteria survive without oxygen and some even find the presence of oxygen poisonous. However, the levels of radiation on Mars may severely constrain the existence of life there. We know of mechanisms in terrestrial organisms which counteract the deleterious effects of radiation, but of no organism which survives for long periods of time under intense radiation. The biological importance of Martian radiation cannot be satisfactorily assessed until we have some information about actual radiation levels on Mars. The near absence of water presents perhaps the most difficult hurdle to our understanding of how Martian organisms might propagate. It is conceivable that water would be available in saturated salt solutions. This water would not readily evaporate and might be made available through biological mechanisms. There are terrestrial examples of organisms that must live in saturated and near saturated salt brines in order to reproduce and carry on their metabolism.

In summary, Mars presents an exceptionally barren and hostile environment by terrestrial standards; yet we must not forget that our frame of reference is limited. We who must depend upon oxygen find it difficult to appreciate that some organisms are quickly killed by oxygen.
Similarly, we may be imposing too narrow a human, or at least terrestrial, view upon the limitations of life on Mars. Certainly no single factor, such as the high temperatures of Venus, clearly excludes the possibility of life as we know it.

Granting, then, that there is some likelihood of life on Mars, or at least that its absence is not clearly established, what sort of experiments can be designed? This question has been pursued at the University of Rochester along lines originally proposed by Professor Wolf Vishniac. While at Yale University, Vishniac suggested a device which would look for the growth of microorganisms and, when growth occurred, radio this information to the earth. This device inevitably was nicknamed the "Wolf Trap" by some of his colleagues.

The principles of the Wolf Trap are remarkably simple, but the problems of building an instrument which can survive both a rocket launching and the journey to Mars, and then operate reliably, are formidable. In 1959 Professor Vishniac built his first device to demonstrate, on the earth, the feasibility of detecting automatically the growth of microorganisms on Mars. When operated either on the laboratory floor or outdoors, the feasibility model both grew microbes and signaled their growth within a few hours after activation. A more sophisticated version of the Wolf Trap has since been constructed; another model, completely suited to space flight, will be delivered next summer.

At the heart of the Wolf Trap is a growth chamber with an acidity (pH) detector and a light sensor; the former, to sense the changes in acidity which almost inevitably accompany the growth of microorganisms, and the latter, to detect changes in the amount of light passing through the growth chamber. Microorganisms, such as bacteria, turn their culture medium turbid (cloudy) when they grow; this change in turbidity is measured by the light sensor. The pH measurement complements the turbidity measurement by providing an independent check on growth and metabolism. When either or both of these changes occur, the sensor can communicate this fact to a telemetering device which in turn can relay the results to earth.

The most important conceptual limitation in designing an experiment for Mars is the necessary assumption that life there must resemble life as we know it on earth. (There is no meaningful sense in which we can accommodate to the oft-cited objection that life on Mars may be so totally different from life on earth as to defy our comprehension and experimental methods. We can, by definition, only understand that which is comprehensible.) We try to overcome this limitation by figuratively stepping back a pace and trying to conceive what modifications in the chemistry of life could exist and still fall within our ideas of what is living and what is not. As yet, an acceptable suggestion for a completely alien chemistry for life has not been proposed.

An even more practical difficulty arises from our life-as-we-know-it assumption: any experiment that we design will grow terrestrial organisms. Thus, if terrestrial organisms were introduced into the experiment while it was on Mars, the experiment would become meaningless; and, of course, organisms from earth could be found on Mars if we carried them there on the surface of the very spacecraft carrying the experiment. To combat this possibility we must decontaminate every experiment and every spacecraft involved. (To oversee the decontamination procedures in Washington and to certify that proper precautions are taken, the post of "planetary quarantine officer" has been created—a post that not very long ago would have been associated with science fiction rather than science fact.) The need for decontamination, incidentally, places a particularly difficult task on the shoulders of the engineers who must design instruments to withstand the rigors of sterilization procedures. For example, the temperature cycles involved in such procedures damage many of the sensitive electronic components normally used in electronic circuitry for spacecraft; thus, new materials and components must be developed. As difficult as this task may be, it must be done, for the manner in which we proceed now will determine whether we can ever recover meaningful data.

The search for life on Mars naturally has its opponents. They adamantly declare "no life is possible on Mars" or "greater rewards can be achieved on earth." I personally believe that it is futile to take sides in this dispute. I don't believe, for instance, that we can, even in principle, rule out the possibility of Martian life without going to Mars! Impelled by native curiosity alone, Man is moving into space. He is doing so in spite of the voices raised against the choice of projects and in spite of charges that spending our money on space projects is folly when so much remains to be done on earth. Although these criticisms may alter the direction of space exploration or change the pace at which we explore our solar system, rocketry, satellites, and space probes will become as much a part of our future as airplanes and automobiles. That being the case, the question becomes one of priorities. I submit that there is no job more challenging and urgent than exploring Mars for life or pre-life. (The physical sciences need not worry about contamination and therefore face no deadline.) To succeed we must be ingenious in the design of experiments, and above all else, we must not contaminate Mars with terrestrial organisms. Mars must become a biological preserve—one that must be conserved as assiduously as any valuable terrestrial commodity. If proper precautions are observed, we have the prospect of adding in the near future a new perspective to Man's search for self-understanding.
Last fall the University admitted 861 River Campus freshmen—the largest entering class in its history. Nearly nine out of ten students came from the top fifth of their high school graduating classes; seven out of ten came from the top tenth of their classes. How were they chosen? What qualities does Rochester look for in its prospective students? To discuss these and other aspects of admission, Rochester Review recently assembled a panel composed of Richard C. Mack, '45, and Virginia Brayer Mack, '45, who, as parents of a high school senior, are heavily involved in the complexities of admission procedures; George Dischinger, '49, River Campus director of admissions and student aid; and Joseph Cole, University dean of student affairs. Some excerpts from their taped discussion follow.

Mr. Dischinger: Last year the University had approximately 2,700 applications for admission. At the moment we are running roughly 100 ahead of last year's applications. We will probably find that most applicants will be qualified. In terms of high school records, College Board test scores, school recommendations, and personal qualifications—their credentials will indicate they can do the work at Rochester. So our job is not primarily to select candidates who will succeed, but to select a group that both meets our numerical goal (the number of students we are aiming for) and within its membership provides the "mix" and diversity that will give the kind of student body we want.

What kind of student body do we want? Of course, we want one that is academically sound, is ready to enter and to perform satisfactorily; but beyond that we're interested in diversity in terms of economic background, vocational interests, and goals—and we use our interest in diversity in selecting our entering class.

Mr. Mack: We have a son who will enter college next year. If you were in our position, what factors would you weigh in deciding whether to apply to Rochester?

Mr. Dischinger: Let's assume that he does want to go to college, that he is mature and has a reason for going. We should ask whether his high school program has provided the kind of preparation needed for successful work here and whether the calibre of his work indicates he can make the most of a strenuous academic program without great strain or probability of failure. As evidence, we'll have the records provided by his school, which presumably has had an opportunity to observe him for a few years, and we'll have his College Board scores. As I pointed out, in terms of the mass of 2,800 to 2,900 prospective students, most applicants will have satisfactory records.

Mr. Mack: But what is "satisfactory"?

Mr. Dischinger: In terms of high school preparation, the best guide is rank in class. Most applicants who come here and do a satisfactory job rank in the top fifth of their high school classes. Obviously, that's only a rough guide, but it's better than giving an average. You know the problems involved in averages.
Mrs. Mack: Do you use the four-year school record?
Mr. Dischinger: We normally have available a three-and-a-half-year record; we usually don't have the fourth year. But we work with rank in class because it takes into account the differences in grading systems among schools.
Mrs. Mack: How much emphasis is put on College Boards?
Mr. Dischinger: To talk about Rochester specifically, rank in class and College Board scores are important. But because our candidates present such strong credentials, small differences in College Board scores won't count heavily with us because we are in a position to go beyond test scores and rank in class to look for other qualities that really can't be quantified.
Dean Cole: As we think about admissions at the University of Rochester I think we ought to remind ourselves of the kind of institution we are talking about. We must remember that for a hundred years this has been a university that has concerned itself with a controlled environment rather than in taking lots of students, and it has had a very liberal, very progressive approach to its academic and its student-life programs. And, through its residence policy, it has been wedded to the belief in a community: one in which able young people are joined together with outstanding faculty to create a two-way kind of environment. By that I mean that students come here and get a great deal from the University—but they're giving to the University as well, and there's a kind of inter-action at the intellectual level, the social level, practically all levels. And it's important to realize that we're at the point in the University's history where we're saying we want to be a University with the very best faculty, the very best students—and yet we're committing ourselves to preserving the good traditions of the past, such as this spirit of community, and to strengthening them.
Mr. Mack: This would indicate that you're concerned about the distribution of students which George touched on earlier—distribution scholastically, but, beyond that, geographically and perhaps socially.
Dean Cole: And this also indicates that we're very interested in our applicants as human beings who will take their places in a community and enrich this community because of their diversity: geographical diversity, intellectual diversity, interests in various aspects of human life—some in the arts, athletics, and so forth.
Mr. Mack: I'd like to get back to whether we should apply in the first place! What about the College Entrance tests? What range should an applicant be in?
Mr. Dischinger: We have no cut-off score. If a candidate is to be like most candidates, his scores should roughly be between 500 and 800 (800 is the top of the scale; median score of our applicants probably will run in the lower 600's). So his scores will be close to 600 and he'll be in the upper fifth of his high school class. That's as far as we can go.
Dean Cole: Other things being equal, the person who presents strong high school records, strong College Board scores, very rich personality, and breadth of experience becomes "the ideal candidate." But there are students who don't have strong high school records and strong College Boards, who have some special interests but are not the all-American boy type. Now we don't want to discourage this sort of applicant. But the person who is weak all across the board probably isn't wise in applying to this kind of college; if he does apply, he should also apply to other kinds of colleges.
Mr. Dischinger: Joe made an important point when he indicated that we can't talk about admissions as a separate entity, unrelated either to the college we serve or to the group of schools and students and parents we serve. Often there is the impression (which to me is clearly false but is not widely recognized) that the Admissions Office sets the academic standards of the college. It might be nice if we could, but we can't. Our faculty and students set standards in some kind of delicate balance determined by the expectations of the faculty and the ability of the students to meet these expectations. And there is another false impression that somehow the Admissions Office can determine who is going to apply. We might like to do this and we do a great deal to try to influence the applicant group, but the fact is that we really don't control this. Highly qualified students apply here not because of our office but because of the University's reputation for offering high level work and a challenging, interesting environment—and one of the necessary evils is that they must come through the Admissions Office, where we have the job of sorting.
Mrs. Mack: What about students with less outstanding qualifications? Does the record show that with increasing maturity they do well?
Dean Cole: The probability is not so great as the across-the-board strong candidates—no question about that. But the evidence still says that a significant number of stu-
dents in this category come to this university and graduate from this university. Of course, the Admissions Office wants to be reasonably confident that an applicant isn’t a way-out-on-a-limb risk.

Mr. Dischinger: About this business of risk-taking. Often we hear the question, “Doesn’t the university take any risks?” I think that puts the emphasis on the wrong place: the risk normally is taken by the candidate and his parents, not by the university. Occasionally some people want the University to take more risks, not recognizing that you’re, in a sense, playing with the life of a student.

Mr. Mack: Back to this point of diversity. Assuming all applicants were exactly at the same scholastic level, what benchmarks would you use in selection for diversity? Do you, for instance, have a quota of so many students from New York State, and from outside New York; or, in terms of social diversity, is there a desired number of people from various social groups?

Mr. Dischinger: We’re not interested in working with quotas, but in working with individuals who we think provide in themselves one or more of these specific types of diversity. Let’s take the simplest example: programs of study. Within the River Campus colleges we have programs in more than twenty fields in the College of Arts and Science plus the professional programs of the College of Education, the College of Business Administration, the College of Engineering and Applied Science . . . and within the group of qualified candidates, we try to achieve some kind of diversity.

In terms of social and economic background, I think the Great American Dream is that we’re all middle class. Actually, we find some people who appear to be very, very rich and some who appear to be very, very poor. Often they will try to hide this if they can, but there are ways of knowing! Now, not many are at either end of the scale—and this is a comment in part on our society and in part on the kind of student who goes to college—but this is something we need to be alert to. We wouldn’t set a quota for rich people or poor people, but we certainly wouldn’t deny admission to able students from either extreme, and we are interested in having them for the diversity they would provide.

Of course, it’s hard to anticipate the kind of interesting background the student will have. I don’t know how you’d establish a quota saying we want X number of young men or women who have done a certain kind of summer work, for instance. But we like to find a student with some special experience. For example, we have a freshman who, some years ago, decided he wanted a summer job other than going to camp or cutting lawns. One way or another he got a job working in the galley of an ocean liner—peeling potatoes, going back and forth all summer long—and he did the same thing last summer.

This is unusual, and the fact that he had the imagination to go after such a job interested us.

Dean Cole: I’d like to ask a question. You people who have been associated with the University in the past and now have children who are going through this process—how do you, as parents and alumni, view the University and this whole question of admissions? Maybe we could learn a lot by listening . . .

Mr. Mack: Well, most alumni feel the campus environment tends to be more and more scholastically oriented. Some feel this is good; some don’t. Most of us are glad we’re not applying for admission today!

Dean Cole: This is probably characteristic of most colleges and universities. My daughter has just graduated from a nearby college and I’m quite confident that the standards at her college are different now from what they were when she entered, and that when she entered they were different from what they were four years before that. We’re all caught up in this kind of re-structure: good colleges are becoming better.

I don’t believe Rochester aspires to elevate its sights further in terms of quality. I think we feel we’ve always had a very sound base and that, as we grow, we haven’t sacrificed that base. And I think one of the real challenges of the next decade or so is this: Given the rich potential of good students and faculty, a clear sense of purpose, and a residence policy whereby 95 per cent of the students live on campus, how do we make this place attractive to people whose interests go beyond merely using the University as a market place for getting the academic preparation necessary to enter a specialized profession? We want this institution in the future, just as in the past, to provide the kind of educational experience that trains citizens who will not be just physicists or just doctors—but who will get their undergraduate degrees and then go out and live in communities where they will play important roles.

Mrs. Mack: By the way, what percentage of Rochester students come here?

Dean Cole: In 1948, perhaps 75 per cent of our student body came from the Rochester area; today, about 10 or
weight in admission than you might expect. A number of studies have indicated that an interview is not a very valid way of judging what a person is going to be for the next four or ten or thirty years. Then, too, self-screening goes on even in the selection of colleges to visit. Although we see hundreds of students, the differences that you can note in a twenty-minute interview are really not major because applicants have tended to screen themselves out. Finally, you’ll find that when the impression gained in the interview is positive, you also will get positive information from the other credentials you gather—and vice versa.

15 per cent. However, the absolute number hasn’t changed much over the years. For quite a while we had 130 to 150 from Rochester in each entering class, but since the class was getting larger, Rochester students accounted for a relatively smaller proportion. This year, however, the figure dropped to 76. Now this doesn’t reflect a negative attitude in the Admissions Office; indeed, we make more offers of admission on a percentage basis to Monroe County youngsters than to those from any other area. Actually, there has been a decline both in the number of Monroe County applicants and in their acceptance of our offers of admission.

The reasons are probably tied to relative states of affluence: More people from this area can afford to send their children away to college; on the other hand, now that our tuition is $1,800, some youngsters who would commute in order to save money find there are colleges away from home at which $1,800 or a little more will pay both tuition and living expenses. I think that these sociological factors often are significant influences.

Mrs. Mack: How important is it for applicants to visit a prospective college for an interview?

Mr. Dischinger: Let’s separate the elements of your question. First, how important is it to visit the campus? I think that if you’ve done some screening and sorting and exploring and have selected some colleges that seem appropriate, it’s worth investing time and money in a visit to see whether—in terms of bricks and mortar and the people you see and the attitude you find on campus—it’s what you expected. If you haven’t done your homework, so to speak, and just rush around without preparation to several campuses, you will find the rewards are not very great—except that at the end of your travels you can probably come out with some things that you could have gleaned just by doing some homework.

Now, implied in the visit is the admissions interview. How much does this count? Probably less than the folklore would have us believe. I think most colleges recognize that in an interview some information and some insights are gained on both sides. But the impression a student makes at an interview is probably given less

Mrs. Mack: Then the interview probably is more important to the applicant than to the college.

Mr. Dischinger: Yes, and I think that applicants should relax about this and be aware that in most cases the interview will not turn the tide one way or another. But I’d like to separate the visit from the interview; certainly, if you prepare for a visit and know what you’re looking for, it can be worthwhile.

Mrs. Mack: Do most applicants visit the campus?

Mr. Dischinger: About 70 or 80 per cent. But if we restricted our admissions to those who visit, obviously we would miss many people from the West Coast, Hawaii, and so forth. Dean Cole often points out, and I agree, that a visit and an interview indicate a candidate is seriously interested in the college. Now, the person from Hawaii who doesn’t visit is one thing; but if you’re talking about someone from Brockport—if four out of five candidates from Brockport visit and one doesn’t, it would be safe to assume that the non-visitor is less interested than the others.

Mr. Mack: Are there statistics that indicate by some measure of scholastic honor, such as Phi Beta Kappa, or graduation with distinction, that you can correlate college performance with entrance requirements?

Dean Cole: Certainly there’s a positive correlation between our antecedent variables—high school record and College Board verbal and math scores—and later performance. It isn’t perfect, but the tendency is there. The stronger you are in these things, the greater the probability that you’ll be among the top people four years later. Still, you can’t say the man with the best school record will achieve the best college record; all you can say with confidence is that of 100 people in the top category, more of that group will end up at the top than among 100 with weaker qualifications.
and the true aim of a college education. There are very worthwhile people who will not be eminent scholars here or ever—people who we think can gain a great deal from the University of Rochester, who can contribute a great deal to society, to themselves, and to their families.

Dean Cole: Interestingly enough, something that society prizes—the Phi Beta Kappa key—can almost be reduced to an arithmetical average. It’s almost a straight quota system; you decide on a certain percentage of people and you start from the top and go down and you rarely reject anyone who has met the average. So there’s almost a positive correlation between grade-point average in college and the student’s previous record. And this raises the fundamental question of the intrinsic versus the extrinsic reward system of society, because a Phi Beta Kappa type of award almost encourages people to do things for the wrong reason.

Mr. Mack: In the same vein, what are the statistics on dropouts?

Dean Cole: It’s both a positive and a negative picture, depending on how you look at it. It’s positive in that a very small percentage of our students leave because of academic difficulties. Typically, for the entering class, 3 to 4 per cent leave by action of the University because of academic inadequacy. This is very low—so low that it is hard to make further improvement. Another way of looking at this is to consider the four-year picture. We don’t have a large body of data but I can tell you about one class, the Class of 1963, 73 per cent of whose members received their degrees from the University on time. Another 5 per cent got their degrees from another university, which meant that they hadn’t left here because of academic incapacity. Another 12 per cent were still in progress, half of them here, half at other colleges. So 90 per cent had completed their work or were still successfully pursuing their work—and we can’t even say that the other 10 per cent were not at college since some didn’t tell us what they were doing or didn’t respond to our questionnaire.

Another way of looking at this is that, for the last five years, the size of the graduating class, on a five-year average, has been 85 per cent of the class admitted. This is not a pure figure, of course, because it includes some re-admits and some transfers.

Mr. Mack: There seems to be a conflict in that you have a large number of applicants, yet you want more; that is, you expect to have to reject a greater percentage of applicants in the future, yet you’d like to have the alumni suggest applicants.

Mr. Dischinger: That’s because we’re not concerned simply about quantity, but about diversity and quality and this is an area where individuals can influence the composition of the applicant group. Every applicant adds to the potential pool of candidates—not just in quantity, but in the potential diversity of that pool. Alumni can and do play an important role in bringing the applicant group to Rochester. For example, about 14 per cent of our current freshman class directly or indirectly resulted from alumni interest. Some 50 freshmen are sons and daughters of alumni... others applied through the Alumni Regional Clubs’ Admissions and Scholarship committees, and so forth.

Mr. Mack: Do alumni children have any special status?

Mr. Dischinger: Yes, other things being equal, they do get preference in our offers of admission and we’re conscious of every alumni child. If such a prospect’s background is solid, we welcome him. If his qualifications are questionable, we discuss the situation with his parents and then present this proposition: If you and he want to take the risk, we’ll accept him. However, if we feel a youngster won’t have a good experience here, we talk things over with his parents and give him an opportunity to withdraw his application. Sometimes, of course, confidential matters are involved that can’t be discussed; therefore, from time to time, individuals may feel we have used poor judgment. And we have to recognize that we may be wrong!

Mr. Mack: Can alumni do more to help attract prospects? Are there any dangers in alumni activity in this area?

Mr. Dischinger: We’re working on a program that will bring members of the regional Admissions and Scholarship Committees to Rochester to reacquaint them with the University so they can help potential candidates decide whether to apply. Of course, the alumnus isn’t supposed to be a field officer for the Admissions Office; but if he knows promising youngsters, we hope he’ll encourage them to contact us and then let the Admissions Office carry on from there.

Mr. Mack: Is it true that the University environment, as it becomes more academically oriented, is becoming less broadening in other ways?

Dean Cole: No—actually, many students are involved in activities outside of their studies. One of the major activities is student government, but not in the old “political” way... it’s more in terms of the “civil service” aspects, for example, the way students spend their budgets in a broad range of activities. We must realize that our students are tremendously interested in academic work, but they’re also interested in a variety of activities. The University is taking a positive attitude toward enriching this environment and I feel this is one of our greatest opportunities: to preserve a healthy climate—social, athletic, cultural. Indeed, much of our planning for future facilities will be to enrich and strengthen the campus environment, and from this will come an even better program.
EXCHANGE An anonymous gift of $12,000 will enable the University to expand its student exchange program with Negro colleges and universities. Under the program, launched early last spring by the Rochester student government, two co-eds from Howard University studied here during the spring semester and two UR students are at Howard this semester.

RELEASED TIME Professor Robert E. Hopkins, director of the Institute of Optics, has asked to be relieved of his administrative duties in order to devote more of his time to teaching and research at the Institute. An internationally known optical scientist and one of the world's leading lens designers, he has headed the Institute since 1952. Until a new director is appointed, a group of senior faculty members of the Institute will serve as a steering committee on administrative matters.

CONFERENCE Believed to be the first of its kind, a conference on "The Remote Effects of Cancer on the Nervous System" was held at the Medical Center in the fall. Chairman was Lord Brain, one of Great Britain's most distinguished neurologists.

BIRTHDAY The Men's Glee Club, 89 going on 90, has planned a bang-up celebration of the 90th anniversary of its founding next April. The 74th Home Concert will be presented on April 3, preceded by a banquet for some 100 former members of the club. To keep them posted on further details, the Music Office in Todd Union would like to hear from all Glee Club alumni who are not already on the club's mailing list.

PROFESSORSHIPS In recognition of their scholarly achievements and contributions to the University, two faculty members have been promoted to endowed professorships. They are Professor Lionel McKenzie, now Munro Professor of Economics, and Professor Johannes Holtfreter, Harris Professor of Zoology. McKenzie, who is chairman of the Department of Economics, will continue in that post.

PROGRAMMING IN PRACTICE While research in programmed instruction has been rapidly pushing forward, classroom use of this technique has not been growing as much as might be expected. A researcher from the College of Education, Assistant Professor Jerome P. Ly saught, is directing a study to determine to what extent teachers who have taken programming courses are applying their new skills when they return to the classroom—or if they are using the techniques at all. The outcome of the survey will help to determine whether emphasis on such courses should be increased or if some alternative approach should be developed.

PRESIDENTS On successive Thursday evenings in February, Dexter Perkins, emeritus professor of history, will present public lectures on four of our nation's presidents—Theodore Roosevelt, Woodrow Wilson, Franklin D. Roosevelt, and Harry Truman. Hoyt Hall was filled to its last seat for his series last fall, "With the Founding Fathers."

FESTIVAL Walter Hendl, director of the Eastman School, conducted the final concert of the 13th annual Festival of Chamber Music at the Library of Congress, sponsored by the Elizabeth Sprague Coolidge Foundation. Hendl directed members of the National Symphony Orchestra in the world premieres of three cantatas. Another prominent figure at the festival was the School's former director, Howard Hanson, who was there to hear the first performance of his work, "Four Psalms."
cooperative group can be assembled. Usually the executive secretaries of such committees are governmental personnel. Since they prepare the agenda and write the minutes of the meeting, a suitable final outcome of the committee's effort can be arranged.

At lower levels of policy making—for instance, in the panels that advise on grants—the advisors are generally much closer to creative science. Also, usually their advice is honestly employed. But the advisory staff is again in position to implement its own prejudices and to exert very great influence in subtle ways.

The mechanism by which authoritarianism influences and shapes science in the United States is the control of funds. No single person is today in control, though at times individuals have come close to being czars. Federal shaping of this hobby of chemistry represents a composite summation of a number of programs. As a result, some areas of science are richly supported (space, for example, and molecular biology) while others such as chemistry are starved.

Adequate financial support for basic research in chemistry in universities should enjoy a very high priority among the federal granting agencies. Chemistry is crucial to science and technology alike. Advances in most sciences are dependent both on superior chemical techniques and on new fundamental understanding of matter and its reactions. Chemistry is central to many fields, among them biochemistry, molecular biology, neurochemistry, chemotaxonomy, and solid-state physics. Advances in pure chemistry are prerequisites to progress in applied chemistry, including such fields as polymers, petrochemicals, and chemotherapeutics.

During the last decade chemistry has been out of the spotlight as attention has been focused on atomic energy, electronics, and space. In all these activities the science has had an important though not always clearly identifiable role. Over the long haul the strongest nation will be the one that applies chemistry most effectively. The long-range interests of our nation require a strong chemical profession, and basic to this are strong chemistry departments in the universities....

In the light of the importance of chemistry and the number of students being trained, a substantial fraction of the total support for basic research should go to chemistry. But this does not happen. During fiscal 1963 total government support of basic research in chemistry in universities amounted to about $38 million. In the same period the space agency was providing more than $500 million for research in space, and another $3.2 billion for development work. In fiscal 1964, support for chemistry increased only slightly while support for the National Aeronautics and Space Administration increased more than 30 per cent....

Why has space, which is of limited importance, fared so much better than chemistry, which is fundamental? The answer is that space is spectacular. Science administrators and scientist-politicians know that Congress will respond to spectaculars but that it is cool to the solid, painstaking work that small step by small step builds lasting science.

By providing large sums for some activities and relatively less for others, Congress and the granting agencies are shop-
exceptions there are no staffs to aid in preparation of material. A major reason why research and development legislation is not more adequately discussed is a lack of evident immediate clash of self-interest among scientists. The self-interest of those who advocate expenditures is obvious, but who makes the probing counterargument?

Failure of scientists to criticize publicly programs that many consider ill judged often stems from analysis of the balance sheet of their own self-interest. On the one side is the consideration that the long-term interest of their profession and the nation dictates that unwise expenditures not be made. If the public loses confidence in the integrity of scientists, the sequel could be harmful for all. But this is the nebulous possibility that does not outweigh the realities of the present. In questioning the wisdom of the establishment the witness pays a price and inures hazards. He is diverted from his professional activities. He stirs the emnity of powerful foes. He fears that reprisals may extend beyond him to his institution. Perhaps his fears are shadows, but, in a day when almost all research institutions are highly dependent on federal funds, prudence seems to dictate silence.

I have outlined a situation in which the forces of authority have gained advantages in the conflict with those who follow the urging of self-interest. But let us not spend too much time mourning the good old days. Authoritarianism has always been with us. We would do well to analyze the situation and attempt to be constructive. What is at stake in this conflict? Should society concern itself with science vs. authoritarianism? How can we prevent its gaining further domination over science? How can we minimize its effects on the work of scientists? Important aspects of the future of our civilization depend on this struggle. Economic, military, and spiritual issues are at stake. It should not be necessary to emphasize the role science has played as a foundation on which to build a complex technology, and I shall not labor the point. We tend, however, to lose sight of the values of science in less material fields. Today most of the earthly land frontiers have been explored. Where can society look for innovation? For new challenges? We must change continuously, or we stagnate. Among our best sources of innovation are science and technology. Keeping science free of authoritarianism is essential, for the spirit of science is innovation. One other value of science has not been much discussed of late. It springs from man's hunger to know. Even today we are faced with many unknowns. They represent an invigorating challenge to man and to science. When science thwarts the frontiers of ignorance it does so for all men, and all men can enjoy a greater sense of the dignity of man for it.

Society, then, has a stake in the conflict, for authoritarianism can cripple science. On a national scale we have the example of the Soviet Union. The success of Sputnik may blind some to the effectiveness of Soviet science, but a detailed examination indicates that along with strengths in some areas go gaps and serious weaknesses in others. In the practical sphere an example is the Russian performance in the field of plastics. They have recently signed a contract to import a plant from England. The Lysenko affair in genetics is one of the more unsavory episodes in science anywhere. We have also observed the effects of authority on a more limited scale. At long last the German universities are acting to limit the privileges of their authoritarian Herren Professoren. All scientists have seen around them examples of authority being in error in attempting to dictate research programs.

A crucial problem in safeguarding science is to find means of financing research without subjecting it to the wrong kind of controls. At the same time we should not adopt the fuzzy-minded approach that scientists should be supported without any checks or restraints. At the very least we must remember that federal funds have to be managed responsibly and must be accounted for.

If we reflect on the conflict of science and authority we can see that the danger comes not from mere authority but from monolithic authority. In some fields of research in which the federal government furnishes most of the money there is no present problem. Funds are available from several granting agencies. No single individual is in a position to dictate who or what gets supported. Other areas are not quite so fortunate—chemistry, for instance. Looking ahead we can see that powerful Congressmen, especially members of the Appropriations Committee, could, if they chose, blackmail almost any area of science, particularly those that sound esoteric. Moreover, Congress could move toward eliminating the multiple-agency approach. A favorite Congressional target is waste and duplication. It could easily be argued that allowing two agencies to provide grants in the same area of science is wasteful duplication. Furthermore, there has been persistent talk about establishing a single department of science. Presumably this would diminish duplication and thus bring on the worst consequences of authoritarianism in government funding.

The best reply to present dependence on federal funds for research would be the development of alternative sources. For example, if the states were to assume only a moderate fraction of the burden the situation would be much sounder. Even were the present dependence on federal funds to continue, the methods of allotment could be changed so that a substantial part of federal research funds, for example, 25 per cent, should be given directly to the universities, the university administrations to be responsible for their proper and wise expenditure.

Such a move would not bring on universal Utopia. In a few universities distribution of the funds would be governed by petty tyrants or by log-rolling. But diversity of judgment would be greatly increased, and in at least some universities the quality of administration would be brilliantly superior to anything Washington could offer. Indeed, we can safely predict that out of this diversity would arise new and superior methods of allocating money for basic research in this country.

Direct allocation of funds to universities could help correct some present imbalances in distribution. Some efforts in this direction must be taken to avoid the calamity of making research funds part of an out-and-out pork barrel. Over the long pull, perhaps our greatest problem is not merely money; it is courage. We must create conditions under which at least a few of our scientists will feel free to question the wisdom of the establishment.

I would suggest that it is of the utmost importance that we achieve in this country a new revolutionary development. We must establish a situation in which at least a few first-class universities carry on excellent research while taking not one cent from the government. Were this achieved, it would not be surprising if the faculties of these establishments quickly became the elite of science and the envy of the academic world.

Today, all of us are indebted to Galileo and the patterns he established, but we too can make lasting contributions to mankind. We need only exhibit a small fraction of the courage and diligence that he displayed for our lives to count positively in the continuing conflict between science and authority.
River Campus Colleges

1916
WALTER J. E. SCHIEBEL has retired as principal of N. R. Crozier Technical School, Dallas, Tex.

1923
HAROLD L. MILLER has been appointed manager of Vogt Mfg. Corp.'s Learning Industries plant, Canandaigua.

1924
LOUIS SHNIDMAN has been appointed superintendent of gas research at Rochester Gas & Electric Corp.

1925
JAMES W. GRAY has retired from the Rochester Savings Bank as vice-president and secretary after 39 years of service. He recently received the Lester P. Slade Award for his civic contributions.

ELSIE SEWARD has retired from teaching after 42 years.

1927
JEANNETTE C. HOEFFLER has been elected president of the Monroe County Principals Association.

1929
FELIX OTTAVIANO has assumed duties as civilian medical officer at the USAF Hospital Civilian Dispensary at Griffiss Air Force Base, Rome.

1931
JOSEPH C. WILSON has been elected to the board of trustees of the Aspen (Colo.) Institute for Humanistic Studies.

1932
KARL JOHANNES has become professor of mathematics at Wisconsin State University.

1935
MONICA MASON McCONVILLE was appointed by Governor Rockefeller to the 15-member State Board of Social Work.

1937
ROBERT A. LANIGAN has been elected treasurer of the Rochester Transit Corp.

1938
WARREN W. PHILLIPS has been appointed public relations director of the Don Kemper Co., Inc., New York City.

1941
RICHARD WOODS has been appointed professor of accounting and chairman of the Accounting Department at the University of Pennsylvania.

1944
RICHARD S. WILSON has been elected chief of staff at Spartanburg (S.C.) General Hospital.

1946
NORMAN EAGLE is chief school psychologist in Mt. Vernon.

1947
EVERETT L. DUNHAM has been promoted to second vice president in the Life Insurance Department of New York Life Insurance Company.

1948
MARY ANN KENNEDY ANGEL is a staff research member and programmer in the Mathematical Sciences Department at the IBM Watson Research Center.

1949
GEORGE GLASSER is dean of finance and business affairs at Monroe Community College.

1950
CHARLES C. THOMPSON, on leave from Western New York Nuclear Research Center, Inc., is visiting professor of nuclear chemistry at the Institute of Nuclear Studies, National Ising Hu University, Taiwan.

1952
BARBARA TOLBOT to Merle C. Eddy in May.

1953
RICHARD D. LEONARD is plant manager at Sal Cafe Mfg. Corp., Jamaica.

1951
M. JOHN CORSON, ’63GEN, and ROBERT KOPROWSKI, ’48, have been promoted to the post of assistant chief engineer at Rochester Gas & Electric Corp.

Marriages
To Charles F. and MARTHA VOLKORN DARLING, a son, Edward, July 4.

1952
BARBARA TOLBOT to Merle C. Eddy in May.

PETER PERSE to Anne Duchateau in July.

Births

1949
GEORGE GLASSER is dean of finance and business affairs at Monroe Community College.

1950
CHARLES C. THOMPSON, on leave from Western New York Nuclear Research Center, Inc., is visiting professor of nuclear chemistry at the Institute of Nuclear Studies, National Ising Hu University, Taiwan.

1952
BARBARA TOLBOT to Merle C. Eddy in May.

PETER PERSE to Anne Duchateau in July.

1953
RICHARD D. LEONARD is plant manager at Sal Cafe Mfg. Corp., Jamaica.

GILLIS PRATT has been awarded the M.A.I. designation by the governing council of the American Institute of Real Estate Appraisers.
With this issue Rochester Review inaugurates an occasional column of reader opinion. Obviously, such a column will appear only if readers are moved (happily or otherwise) to take pen in hand. Letters are welcomed only as dictated by space and editorial limitations.

To the editor:

As the wife of an alumnus who thoroughly enjoyed Mr. Berg's brief for chaos ("On the Pre-eminence of Clergy" by George G. Berg, Fall, 1964), may I submit a slight rebuttal:

On the Pre-Eminence of Scientists

Back in the twentieth century when men were attempting space travel and thinking they had found the fountain of youth, scientists were top-of-the-heap on the small planet Earth.

Then the humanists and educated moral philosophers (exiled in this planet by materialistic cultures) were concerned about the existence of a universal moral law. Even the great scientist Mr. Einstein had worked towards this idea. One law, one universe in time, indivisible, running like a tidy machine on the fuel of... interdependence?... agape?

But that was before the Law was manipulated by the scientists into instruments of chaos that exploded the one small part of the universe called Earth.

Out there on other, brighter planets the moralists are pre-eminent. They communicate by thought transfer, control bodily functions and aging through the mind’s operation, require little nourishment but communal fellowship; and every seventh day they are required by law to rest.

(Name withheld on request)
Dear Alumni:

Now that studies preparatory to writing a new history of the University are underway, I am eager to accumulate every scrap of information that has relevance. Particularly, I should like to obtain letters, diaries, and the like of men and women who once studied "beside the Genesee." I should like to obtain letters, diaries, and the like of men and women who possess materials of historical value will communicate with me. Cordially yours,

ARTHUR J. MAY
University Historian

A MESSAGE FROM MAY

Marriages

DONALD ROBINSON to Elaine Datger, June 28.
DIANA GLOVER to Dr. B. Dorai Raj, Aug. 13.
ARTHUR DOEGE to Carole Gamache, May 9.

Births

To Dr. and Mrs. Alvin A. Milgram, '62G, a son, Jeremy David, in Aug.

1961

MICHAE A. COHEN has been promoted to editor of Mutual of New York's newspaper.
RONALD A. BRYAN, '61G, has joined the physics department of the University of California.

Births

To Dr. and Mrs. Alvin A. Milgram, '62G, a son, Jeremy David, in Aug.

1962

BARBARA STERR is teaching at the Holmes School in Mt. Vernon.
Catherine Rutstein has been awarded a fellowship at Harvard.
THOMAS F. JORDAN, '62G, has become assistant professor of physics at the University of Pittsburgh.

Births

To Dr. and Mrs. Alvin A. Milgram, '62G, a son, Jeremy David, in Aug.

1963

ROBERT A. YOUNG has received the American Spirit Honor Medal from the USAF.
BRUCE A. HOPKINS is assigned to the USS Hollister as supply officer.
ALLEN I. STEMPLER is attending the University of Mississippi School of Medicine.

Births

To Dr. and Mrs. Alvin A. Milgram, '62G, a son, Jeremy David, in Aug.

1964

JOHN W. CORRIS is attending the Officer Operations Course of the U.S. Air Force Security Service, San Angelo, Tex.
GRETCHEN WILKE CORRIS has been awarded a graduate fellowship in English at the University of Chicago.
LEO A. ZABINSKI has been appointed to the residential advisors program at Colgate University.

Births

To Dr. and Mrs. Alvin A. Milgram, '62G, a son, Jeremy David, in Aug.

Class of '64,
Where Are You?

In graduate school? in the armed forces? honeymooning? By keeping the Alumni Office informed of any address changes, you can be sure of receiving Rochester Review and other campus publications.
Eastman School of Music

- 1930
  Arthur Henderson, '31GE, is teaching at Park Forest Conservatory of Music.

- 1932
  Theodore D. Vosburgh, '37GE, is executive director of the Midland (Mich.) Music Foundation.

- 1934
  Stevenson Barrett, music director and conductor of “Theater Under the Stars,” is teaching voice at Ithaca College’s School of Music.

- 1936
  Julia Wilkinson Mueller is professor of music at Duke University.

- 1937
  Victor Alessandro, conductor of the San Antonio Symphony, conducted the final summer concerts of the 100-member Congress of Strings Orchestra at Michigan State University.

- 1940
  Ulysses Kay, '40GE, has been awarded a Guggenheim Fellowship in music composition.

- 1943
  Dorothy Ziegler has left the St. Louis Symphony Orchestra to become opera coach at Indiana University.

- 1944
  Marylouise Baker, GE, is a music instructor at Texas Wesleyan College.

- 1946
  Robert Emile, '58GE, has joined the Grousom College faculty.

- 1949
  Paul R. Allen has become director of music for the Minola schools.

- 1950
  John Huggler has been selected as the first composer-in-residence associated with the Boston Symphony Orchestra under a Rockefeller Foundation-sponsored program.

- 1951
  John Huggler has been selected as the first composer-in-residence associated with the Boston Symphony Orchestra under a Rockefeller Foundation-sponsored program.

- 1952
  Ron Nelson, '53GE, '57GE, has composed a new oratorio, “What is Man?” which premiered at Convention Hall in Atlantic City.

- 1953
  Frederick M. Miller, '53GE, has been appointed lecturer in the School of Music at Syracuse University.
Charles E. Wunderlich is professor of music at Mansfield State College.

Ronald Onoreika, '54GE, associate conductor of the Cincinnati Symphony, was assistant conductor of the Shenandoah Valley Music Festival.

Robert W. Kiehl is teaching voice at Summit (N. J.) Junior High School.

Blaine Edlefsen, '53GE, professor of music at the University of Illinois, has been appointed a faculty fellow for research in articulation in oboe.

1954
James Tallis is assistant professor of music at Hope College.

Stanley S. Leonard has joined the Pittsburgh Symphony Orchestra as tympanist.

1955
Albert C. Wasmus, '55GE, has been appointed assistant professor of music at St. Michael's College.

Will Gay Bottje, '55GE, has been promoted from assistant to associate professor of music at Southern Illinois University.

Thomas D. Hoehstatd, '55GE, '62GE, has signed a three-year contract as conductor of the Amarillo (Tex.) Symphony.

John Krance's composition, "Scenario for Band," has been performed by the U. S. Marine Band in Washington.

1956
Noel S. Stevens, '58GE, '59GE, has been named chairman of the Department of Music at Tampa University.

Evangeline Rimbach, '56GE, has been appointed assistant professor of music at Concordia Teachers College.

Edmund Soule's ('56GE) American folk text, "One Morning in May," was published last spring.

Joseph Zawistowski has become band and orchestra director of Oakland (Calif.) Public Schools.

Mary Luft Fenwich played an organ recital in connection with the Bicentennial of the American Guild of Organists.

Marriages
Dorothy J. Pozniko, '57GE, to Prof. C. Richard Beam, July 11.

Births
To William C. and Mary Luft Fenwich, a son, William Charles, Jr., March 30.

1957
Craig Hankenson, '63GE, is on the administrative staff of the San Francisco Opera.

Robert A. Spillman, '59GE, has been awarded a Fulbright scholarship.

Marriages
Kathleen Henry to John Clark in May.

Births
To Anne and Paul D. Hartley, '60GE, a son, Andrew, June 29.

1958
Ralph Lewis, '58GE, has been granted a leave of absence from Oklahoma College for Women to accept a Carnegie Foundation grant at the Center for the Study of Higher Education at the University of Michigan.

William R. Nelson is teaching in the Fine Arts Department at Arkansas State College.

Robert J. Buzak, '58GE, has been appointed director of strings and orchestras in the Tarrytown public schools.

William Godley, '58GE, has been appointed assistant professor of music and artist-in-residence at Wisconsin State University.

Marriages
Donald C. Tracy to Gretchen Van Seiver in August.

Births
To Gerald and Betty Remy Burns, '58GE, a daughter, Adrienne Elizabeth, Sept. 12.

1959
Leonard Feldman, '60GE, has been appointed assistant professor of music at Pennsylvania State University.

Roger Sherman is an instructor in music at the University of West Virginia.

Mell Carey, '59GE, has been appointed lecturer and instructor of music at Saskatchewan University.

Vincent Frohne's ('63GE) "Adam's Chains" was given its premier performance in Rome.

Daniel L. Kohut, '59GE, is assistant professor of music at Ithaca College.

Marriages
Janet Danielson, '61GE, to Paul Speaker, June 16.

1960
Allen F. Ohmes, '60GE, has been appointed associate professor of music at the State University of Iowa.

Ray Luke, '60GE, has been commissioned by the Oklahoma City Symphony to compose a special work for presentation next season.

Marriages
Nola I. Marberger to John A. Gustafson in June.

1961
Sally L. Counts was on the faculty of the summer music program at Dartmouth College. She has now returned to teaching in the Lebanon (N. H.) School District.

Paul E. Droste, '61GE, is orchestra director at Lakewood (Ohio) High School.

David C. Ahlstrom, '61GE, is associate professor of composition and theory at Southern Methodist University.

Marriages
Eugene K. Wolf to Jean E. Kessler in July.

Priscilla Beeson to John Marshall, March 2.

Mervyn J. Farra to Karen Sue Turner in March.

1962
Judith Coen has received a Fulbright scholarship for voice study.

Richard Rodean has been appointed director of the University Band at the State University of New York, Buffalo.

Daniel E. Sandige wrote the "LBJ March" which was played at the graduation ceremonies of the Coast Guard Academy, New London, Conn.

Katina Palermo, '64GE, was guest soloist last summer at the Pops Concerts of the Utica Symphony Orchestra.

Gene Tettamanti has joined the Tommy Dorsey Band.

Robert Christensen, '64GE, has been appointed assistant to the director at the Hochstein Music School.

1963
Richard Thorrell is assistant dean of men at St. Lawrence University.

Laurence A. Gibson, '64GE, has been named first violinist and concertmaster for the Evansville (Ind.) Philharmonic Orchestra.

John B. Richardson is playing French horn in the U. S. Marine Band.

Marriage
Gisela Sielaff, '63GE, to Daniel Ochse, Aug. 8.

1964
David Greenhoe is a cornettist in the U. S. Marine Band.

Leigh Hamilton has joined the Peace Corps and is teaching in Sierra Leone.

Shirley Binder has been appointed band and instrumental instructor at Wyoming Co. Central School.

Lyne B. Priest is working on a master's degree at the New England Conservatory.


Medicine and Dentistry

- 1940
  Dr. Charles Harris has received the Colgate University Alumni Association's award for community service.

- 1946
  Frederick L. Stone, '42GM, '48GM, has been named director of the National Institute of General Medical Sciences at the National Institutes of Health.

- 1943
  Dr. Harold Brooks has been appointed to the staff of the Project HOPE.

- 1945
  Dr. Howard Joos has been appointed director of the Department of Pediatrics at Maimonides Hospital.

- 1946
  Dr. William B. Forsyth was elected president of the Monroe County Medical Society.

- 1950
  Dr. Gordon L. Deshler has joined the staff of Metropolitan Hospital.

- 1952
  Dr. Charles Tidball, '52GE, has been named professor and chairman of the physiology department at George Washington University School of Medicine.

- 1953
  Marriages
  Dr. Arnold Golodetz to Virginia Demaree, May 30.
  Dr. Charles Harris to Mabel, May 16.
  Dr. Charles Evarts has been appointed to the Department of Orthopaedics of the Cleveland Clinic.
  Dr. Alan Brown, former medical director of the Tompkins County Hospital, is practicing in Ithaca.

- 1954
  Dr. Donald Hutchings has opened an office in Albion.

- 1955
  Marriages
  Dr. Arnold Golodetz to Virginia Demaree, May 30.

- 1957
  Dr. Charles Evarts has been appointed to the Department of Orthopaedics of the Cleveland Clinic.

- 1958
  Elain Lamerson Hopkins is working in Brazil under a Missionary Aviation Fellowship.

- 1960
  Births
  To Dr. and Mrs. Anne Larkin Gardner, a daughter, Helen Douglas.

- 1961
  Marriages
  Linda Callanan to Dr. Walter Franck, June 6.
  Dorothy Merritt, '61, '62N, to William Land, Jr., in May.
  Newly named assistant dean is Dr. Jack M. Colwill, '57M.

- 1962
  Bonnie Palmer Hull has been appointed to the nursing staff at Pennsylvania Hospital, Philadelphia.

Marriages
  Bonnie Palmer to Dr. James Hull in June.

- 1963
  Dr. Alan Brown, former medical director of the Tompkins County Hospital, is practicing in Ithaca.
  Dr. Charles Harris to Mabel, May 16.

- 1964
  Births
  To Walter E. and Maryann Wallace Caroompas, a son, Walter Eugene, Jr., Aug. 11.
  Bonnie Palmer Hull has been appointed to the nursing staff at Pennsylvania Hospital, Philadelphia.

Marriages
  Bonnie Palmer to Dr. James Hull in June.
  Dolores Juno to John Stuth.

- 1965
  Carolyn R. Aradine is studying for a master's degree at the University of Wisconsin.

Marriages
  Jean Collamer to John Randall, June 20.

- 1966
  Jayne Zinke Crouth has joined the staff at the Albert Schweitzer Hospital in Dechapelles, Haiti.

Marriages
  Helen K. Shietler to Ronald W. Charron, July 31.

Department of Nursing

- 1958
  Elaine Lamerson Hopkins is working in Brazil under a Missionary Aviation Fellowship.

- 1960
  Births
  To Dr. and Mrs. Anne Larkin Gardner, a daughter, Helen Douglas.

IN MEMORIAM

Edward F. Feely, '02, Aug. 28.
Thomas H. Remington, '11, Aug. 11.
Bert W. Woodams, '13, Sept. 11.
Henry M. Sneed, '16, Nov. 2.
Chen-Ping Ling, '18, July 16. Mr. Ling was the UK's first Chinese graduate.
Hugh D. MacEntyre, '18, Aug. 4.
Helen Roblin Roblin, '19, July 14.
Lester M. Slocum, '26, Sept. 28.
John W. Thorne, '27, Sept. 6.
Carolyn H. Cox, '28, Aug. 11.
Lolita May Wilcox, '29, Sept. 23.
Lucile Cook Coomer, '31, July 20.
Blanche Fullmer, '32, July 16.
Preston H. Watts, '33, Sept. 15.
Jessie Howard Steitz, '37, July 13.
Richard Bidwell, '41, July 27.
Richard H. Wendt, '54, Aug. 3.
BUILDINGS GOING UP...

Representing more than $8.3 million in construction activity are two new buildings-in-process: on the South Campus, the Nuclear Structure Laboratory, which will house an advanced Tandem Van de Graaff accelerator; and, just south of the Medical School, the University's first Graduate Living Center. The Laboratory will be operative in 1966; the graduate residence is scheduled for occupancy in 1965.