



T H E S C I E N C E S

STATE UNIVERSITY OF IOWA • IOWA CITY

INTRODUCTION

Science, said Dr. Albert Einstein, is the effort to put together all we can learn about the things we see and feel in the world around us. "It is a way of explaining the universe in which we live," says Dr. James B. Conant.

This effort to understand our universe is nothing new in human history, but we in the twentieth century have managed to learn more, to increase our knowledge at a very rapid rate, and to find more practical uses for what we know. Nevertheless, as we have done all this, we have uncovered still more questions that we cannot yet answer.

So despite its great extensions, the horizon of science still shows no limit; it is nowhere reaching exhaustion. Scientists think of today's work as only a basis for what they will try to do tomorrow. If you are pondering a career, this is something to put in evidence. And consider, too, that even science as we know it today has extended its influence to but a small fraction of the earth's populations.

As is the case in most fields of human knowledge today, science for any individual means gradually learning more and more about less and less. That is to say, a science career requires specialization. But science is no mystery cult; there are no magicians, no supermen, in the laboratories. "The whole of science is nothing more than a refinement of everyday thinking," said Dr. Einstein.

If you look into the starry heavens with wonder and reverence, you have the curiosity of a scientist. If you have planted garden seeds and seen why some of your plants grew faster than others, you have experimented as a scientist. If you have come to a decision by trying to think through all its alternatives, you have probably thought the way a scientist hopes he thinks. If you are a stamp collector, you have perhaps found the pleasure in classifying your stamps that a scientist finds in organizing his facts and ideas.

The traits of honesty, industry, and diligence—the habits of accurate, impartial observation and humble curiosity . . . these are important for success in science, as they are in many professions. A scientist is often his own boss, frequently works alone at his special job.

Initiative, imagination, and self-sufficiency are often important. Ingenuity is commonly the difference between success in one month instead of three.

Today more careers than ever before are waiting for young people in science. Since the Korean War and our new national defense effort, the shortage of scientists has been a very serious national concern. No one can suppose that our national and industrial progress will continue unless we continue to know more and more about science—and its applications to human activities—as the years go by.

No honest college adviser will *guarantee* any student a job when he graduates. But a science student can be as sure as anyone; never have his opportunities been so great.

This applies just as much to women as to men. Most of science draws no line between the sexes, and there is no field in which there are not many opportunities open to both.

A career in science may have begun with a Christmas chemistry set or a summer's collection of grasshoppers. This interest in science is developed through high school and college as the formal educational foundation in science is being laid. With the growth of scientific knowledge, the fields become more specialized. In many areas the biggest opportunities now are for those who have studied beyond the four years of college and who have earned master's or doctor's degrees.

This sounds like a long pull and a hard job, and it is. But no one need commit himself to graduate work when he starts in college. The decision will come easily and naturally, in due time. And remember, too, that once you become a graduate student you are already a professional scientist; from there on you can expect to earn while you learn. At SUI, for instance, most graduate students in science are appointed to part-time teaching or research jobs.

After your college work you can expect as a scientist the freedom—and responsibilities—of a truly professional life. Depending on your field and your interests, you may be able to choose between high school or college teaching, scientific work in an industry, or research in a university, industrial, or government lab-

oratory. You can expect a good income when you graduate. You can expect to advance rapidly, and your work will be governed not by a time clock but by your own desire to progress into the more challenging scientific problems.

You will grow as your science grows, through the scientific meetings you will attend and the interests you will share with colleagues throughout the country. Your college degree will not mark the end of your education. As the years go by, you will find that your profession continues to be a profound and exciting intellectual experience. "Science," says Dr. Rene Dubos of the Rockefeller Institute, "can enrich life with new esthetic and emotional experience, with broader understanding, with stimulating and rewarding mental experience. It provides emotional and intellectual values that increase the flavor and dignity of human existence."

The sciences are an important part of the work of the State University of Iowa. These are the basic science departments at SUI:

Bacteriology—life and processes of microscopic plants and animals

Botany—life and processes of plants

Chemistry—composition of all substances

Geography—study of the earth's substances

Geology—history and life of the earth

Mathematics—"queen and servant of science"

Physics—behavior and structure of matter and

Astronomy—the earth in our universe

Psychology—study of human behavior

Zoology—life and processes of animals

Both undergraduate and graduate students find in these departments a wide variety of both general and specialized studies; detailed descriptions of these many departments are given in following pages of this booklet.

SUI is proud to have started high school graduates from throughout Iowa—and many nearby states—to careers in all these fields. SUI is proud, too, of the scientific honors which have come to the University, its faculty, and its students. The major national science honoraries and professional societies have Iowa chap-

ters, and there is a multiplicity of programs and seminars throughout the entire school year. Science students at the University begin their professional activities long before they graduate, including participation in various inter-departmental programs.

When you come to SUI you come to a center for many educational activities, and as a science student you will participate in most of them. There are concerts, lectures, plays, Big Ten sports events, dances, parties . . . so many that no one can go to everything. You are in all respects a member of a typical college community in a great university.

Those who are looking for "snap" courses don't expect them in the sciences. They are right; education in science is not easy. Laboratory periods for "learning by doing" take afternoon hours from the football practice field and the corner soda fountain. Studying and library work cannot be neglected. But if you have intelligence and interest, you can be successful in science and still find time for the fun and activities that abound on the SUI campus. You do not have to be a stoop-shouldered, bespectacled genius or a retiring bookworm. The scientists who burn the midnight oil in their laboratories—and some do, at SUI as elsewhere—work long hours because they enjoy it.

All SUI students begin their college work with a group of "core courses": literature, historical-cultural and various social sciences. Science students add to these, during their first two years, the beginning courses in their special fields. The core courses and later requirements in other humanities fields, help assure that SUI science graduates are equipped to enjoy and contribute to the democratic society which makes their professions possible.

The basic sciences at SUI are enriched, too, by contacts with the applied sciences. The professional schools—engineering, medicine, pharmacy, dentistry—help give perspective to the sciences on which they are based. At SUI there are unusual opportunities to prepare for a career which combines science with other areas: with education, for science teachers; with journalism, for science writers; with museum studies, for curators and naturalists; with home economics, for

nutritionists and home management experts; with law, for technical patent specialists.

As a science student, you will be asked, when you first come to SUI, in what department you want to work. This is not a final decision; it can be changed after you have had one or two semesters' experience in that field. Before you make your choice, and whenever you want thereafter, you will have the advice of your own special faculty counselor as well as that of faculty in the departments concerned.

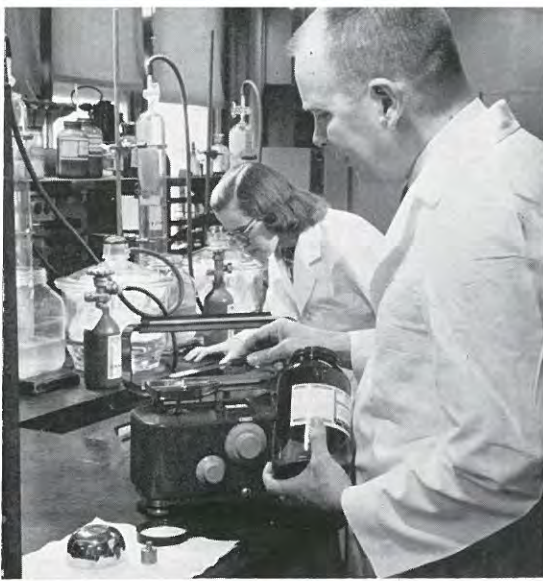
After the first year or two, you will probably find a particular interest in a special field within your major department; then you will want to choose courses pointing especially to this area. You will also choose one or more related fields, outside your major department but still closely related to your interests, in which you will also take courses. After four years you will graduate with a B.S. (Bachelor of Science) or a B.A. (Bachelor of Arts) degree.

Graduate work, if you decide on it, follows much the same pattern, too—more courses in the particular field of interest in your major and in related fields, and individual research projects, the reports of which become theses for master's and doctor's degrees. In SUI science departments, one or two years of graduate work is needed for an M.S. (Master of Science) or M.A. (Master of Arts) degree, and two more for a Ph.D. (Doctor of Philosophy) degree.

If you have graduated from an accredited high school with a satisfactory scholastic record you can enter SUI and continue your science career. If you have taken all or most of the science and mathematics courses given at your high school you will have some advantages of a head start. Some of the basic subjects will have been so completely covered that you will be ready to go right on to more advanced work. Other subjects, though you may still have to take them at SUI, will be easier because you are already familiar with some of the material that is talked about. And, because of your experience, you will surely have a better background for choosing the field in which you are especially interested.

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Applying physics and chemistry, . . .

BACTERIOLOGY

Bacteriology—or microbiology, as it is now commonly called—is one of the youngest of the biological sciences. But it is a rapidly expanding field which offers great opportunities.

Bacteriology, is the study of the multitude of living organisms that are too small to be seen without a microscope. These small forms of life found everywhere exceed in number and kind all higher plants and animals combined. Some of them cause serious diseases in man, animals, and plants, and one important phase of bacteriology is the control and treatment of microbial diseases. But the scientists consider microorganisms so essential that man could not exist without them. In the human body bacteria in the intestines are essential for digestion. Microorganisms are used in preparing some foods—sauerkraut, pickles, cheese, fermented milks, silage, and leavening agents; in making alcoholic beverages and such pharmaceuticals as vaccines and antibiotics; in processing hides and skins; and in retting flax and hemp.

The bacteriologist's job is to know these minute organisms, and to control them so that their work is productive. His tests and tools often depend on physics and chemistry, and if you study bacteriology at SUI these two subjects will be a big part of your work. You will



bacteriology students study living . . .



organisms too small to be seen without . . .

also study botany or zoology and perhaps two years of mathematics . . . all in addition to at least five or six courses within the bacteriology department itself. There is plenty of choice among these, so you can pick courses particularly appropriate to the kind of work you want to do—perhaps teaching, or work in agriculture, medicine, or industry. When you have your bachelor's degree, after four years, you will have a good foundation for a career in bacteriology.

There is a brisk demand for bacteriologists in the chemical and pharmaceutical industries; dairy and food-processing plants; and public health laboratories, hospitals, and such research and service organizations. With a bachelor's degree you will have a choice of work in most of these, controlling the growth and work of microorganisms and identifying unknown bacteria by laboratory tests.

Better opportunities, particularly in research work, await graduates with M.S. or Ph.D. degrees. A full program of advanced courses is available at Iowa, and good students may plan to continue studies in the SUI bacteriology department after receiving bachelor's degrees.

The areas of concentration available in microbiology at SUI are general bacteriology, which includes the basic principles that govern the entire science, and the morphology, physiology and metabolism of microorganisms; medical and public health microbiology, which

deal specifically with organisms closely associated with man and animals; oral (or dental) bacteriology, which covers the many reactions produced by microorganisms in the mouth; immunology, which is concerned with the defense mechanisms of the body; medical mycology, which deals with higher fungi (yeasts and molds) that cause infections; microbial genetics, which deals with the hereditary characteristics of bacteria and other microorganisms; and virology, a rapidly developing branch of microbiology, in which the ultramicroscopic forms causing disease of man, animals, plants, and other microorganisms are studied.



a microscope as they prepare to advance . . .



knowledge of life and combat disease.

Botany is the division of science concerned with plants. Our lives are inextricably linked with those of plants. Plants furnish the oxygen we breathe, the food we eat, much of our clothing material, much of our building material, and most of the fuel we use in industry, in travel, and in heating our homes. Many of our most powerful drugs come from plants. Perfumes and spices; paper and rubber; oils and gums—are all plant products. Plants add to the beauty of our environment and the enjoyment of life. The more we know about them the better we shall be able to live!

Scientists in the Department of Botany at SUI are conducting fundamental investigations in such varied fields as plant growth regulators; the nutrient requirements of plants; the laws which govern inheritance in plants; and the classification, distribution, and relationships of plants of such places as Florida, southwestern Georgia, and Panama, as well as Iowa.

Investigations on plant growth and reproduction at SUI are conducted in greenhouses and specially constructed laboratories where environmental conditions such as temperature and humidity can be controlled. A continuous project in the classification and cultivation of fungi that cause decay of organic materials in the soils, textiles, and wood, and that cause diseases of both plants and animals has been conducted at the University for the past twenty-five years and is being vigorously continued. New laboratories have been equipped recently, one for the study of structure and development of flowering plants and one for the study of fungi. An excellent library with books and periodicals from all parts of the world where plant research is carried on is kept up to date.

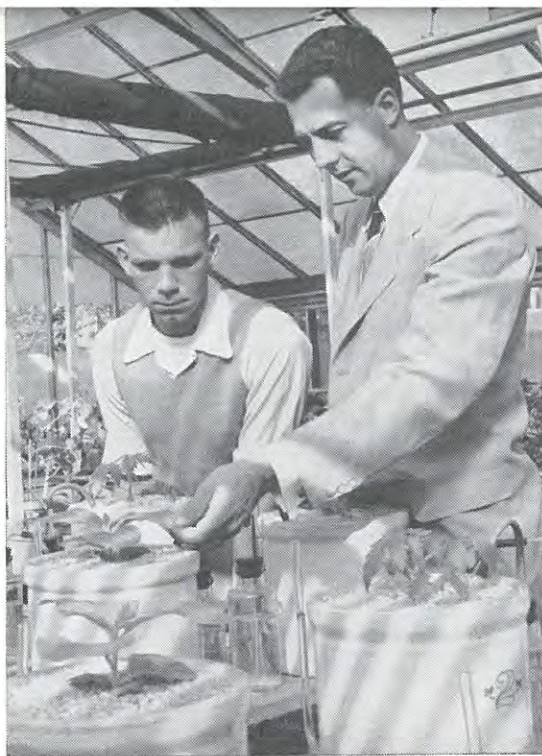
A large active collection of flowering plants, mosses, and fungi from all parts of the world is available for teaching and research, as are also living cultures of fungi and algae.

Those who plan to major in botany at SUI begin with the introductory course in Plant Science. In the remaining two or three undergraduate years, five or six additional courses

BOTANY



With growing plants . . .



in the greenhouse, . . .



with collections . . .

in the basic areas of classification (Taxonomy), functions (Physiology), structure and organization (Morphology), and fungi (Mycology) are recommended. In addition to these and the general University course requirements, botany majors take courses in related scientific fields, such as geology, chemistry, physics, mathematics, and zoology, suggested by their special interests.

With a bachelor's degree after four years of study and a major in botany, you will be prepared for positions in agriculture, agronomy

and soil science; landscape architecture; microbiology; mycology; plant pathology; agricultural chemistry and engineering; chemurgics; conservation; food and drug administration; seed and grain analysis and inspection; water sanitation; commercial processing (food manufacturing, canning); radio and news reporting or feature writing on plant science and marketing news; foreign agricultural service; crop pest control; and plant quarantine.

Former botany students at SUI, for instance, are now science writers for farm and gardening journals. Several have positions with producers of seeds. Some are in the business of developing new types of hybrid corn. Several graduates are in foreign service for the United States Department of Agriculture exploring for new plants for introduction into the United States or are helping as agricultural advisers in countries where new skills are needed to increase the production of food and raw materials. Many are employed in industrial research institutions such as Du Pont & Co. and federal research stations like the Forest Products Laboratory of Madison, Wisconsin.

A great many people who are now employed in related fields have majored in botany while attending college. This is especially true of microbiologists and agricultural scientists. Plant pathologists or "plant doctors" have

of specimens, . . .





botany students investigate . . .



and study the science . . .

nearly all been botany majors. Those who study molds and algae as sources of various industrial products such as alcohols, various organic acids, pharmaceuticals, antibiotics (penicillin, aureomycin) received their basic training in botany. Botanists who have gone back to the soil to use their knowledge directly in farm problems are agronomists or soil scientists.

Foresters, range specialists, and conservationists interested in forest and range maintenance and the feeding and care of game animals have frequently been trained first in botany.

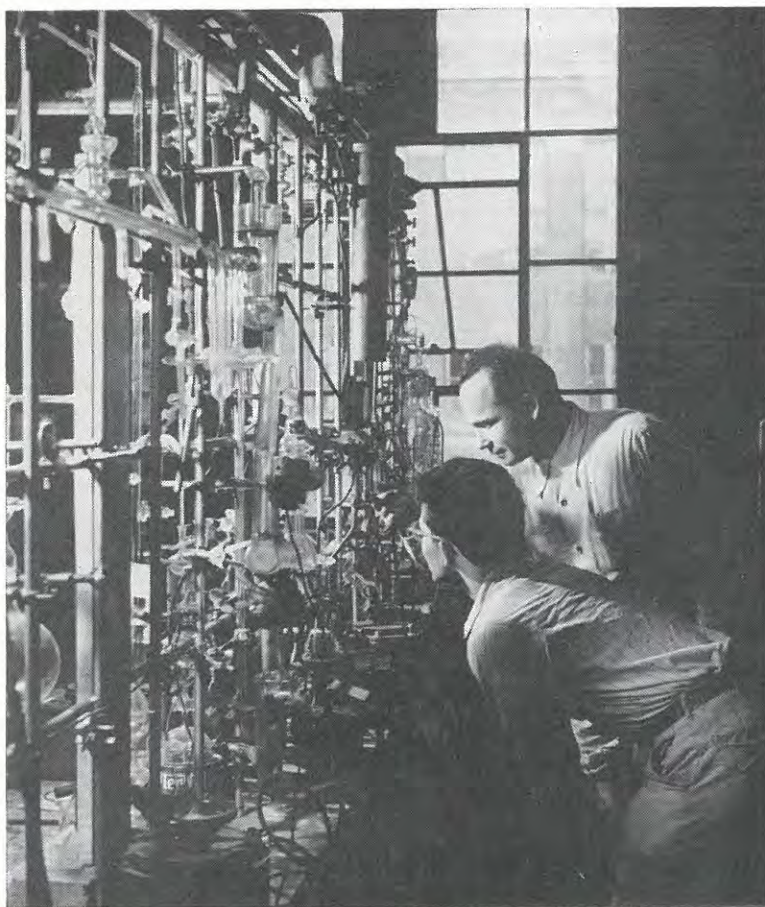
Never in the past has there been as great a demand for well-educated botanists as there is at present. This need is certain to grow enormously in the next few years, as indicated by predictions of the National Research Council and the National Science Foundation. For the more challenging positions, however, one must have a graduate degree, preferably the doctor's degree. A doctorate in botany assures more interesting work, more rapid advancement, and additional opportunities for teaching and research not open to those who hold the bachelor's degree alone. Facilities are available, of course, for obtaining advanced degrees at SUL. A number of scholarships, and some research or teaching assistantships, are available to encourage interested and qualified students. In botany as in all other sciences there are still plenty of new frontiers to be explored. Their exploration is dependent upon the number of young men and women who acquire adequate, fundamental training in science.

of plant life.



CHEMISTRY

In the laboratory, . . .



Modern chemistry is concerned with the materials of our universe—not only the substances occurring or grown naturally (ores, petroleum, air, plants, animals) but especially the methods of transforming the raw materials into items which are becoming more and more useful to us today. We now have Dacron, Nylon, synthetic “cold” rubber, plastics, new drugs (the sulfas, chloromycetin, aureomycin, terramycin, isoniazid), aviation gasoline, modern lubricants, synthetic detergents, and thousands of other items never formed geologically, astronomically, or by living matter. And the future is brighter than the past. There will never be an end of new things—making your possibilities in chemistry infinite.

Students majoring in chemistry at SUI follow carefully planned programs to give them the essential training in four fundamental fields:

Inorganic chemistry studies the acids, bases, salts, metals, and non-metals. New alloys, rare metals, radioactive elements, and new compounds are studied because of their importance as materials in jet engines, transistors, radiation therapy, and insecticides.

Analytical chemistry presents the methods used to find out what is present and how much of an element or compound may be in mixtures. The modern analytical chemist has adapted many new electronic instruments to chemical research.

Organic chemistry concerns the synthesis, structure, reactions, and properties of carbon compounds. Over a million are known, but only



in the classroom, . . .

about a hundred thousand have been developed for use as dyes, fibers, rubbers, perfumes, insecticides, drugs, paints, foods, vitamins, and petroleum chemicals.

Physical chemistry, as the name suggests, concerns the physical properties of elements, compounds, and mixtures; the energy changes in reactions; and the influence of heat, light, pressure, and electricity. The structure of molecules, atoms, nuclei, protons, and neutrons is fundamental.

Majors in chemistry at SUI have a choice of two programs of study. One of these is the regular professional program leading to the Bachelor of Science degree. This program is approved by the American Chemical Society and contains not only the courses in the four fundamental fields outlined above, but also the necessary supporting courses in physics, mathematics, French, and German. Courses in the humanities round out the curriculum. This B.S. in Chemistry program is the one for students planning to seek jobs in industry and in government laboratories; it is also the program which prepares students for graduate study leading to the master's or doctor's degree in chemistry.

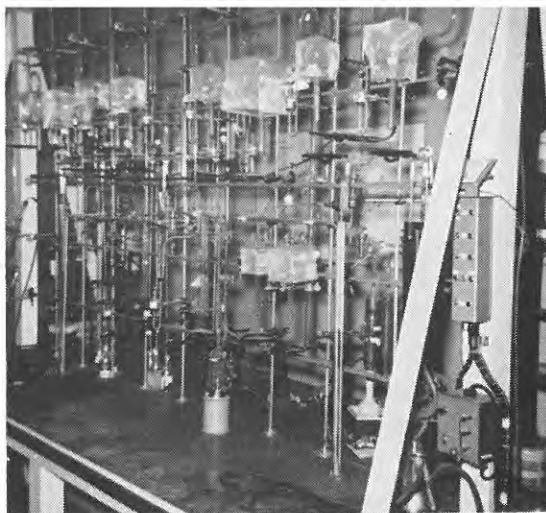
The second program leads to the Bachelor of Arts degree. It has more liberal arts subjects, biological sciences, and other electives and leads to jobs as technicians. By electing proper courses in education it is also possible to secure a high school science teaching certificate.

conducting experiments, . . .

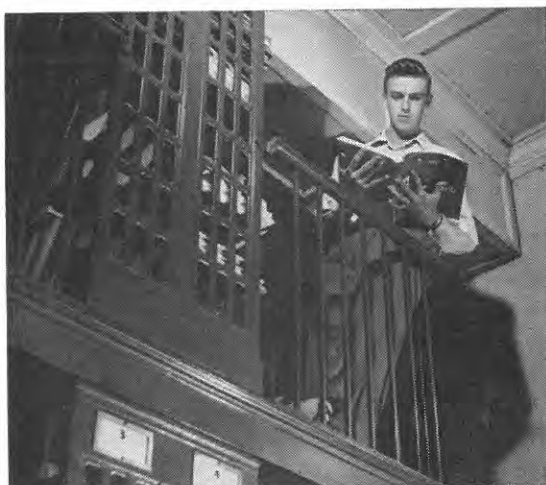


gathering data, . . .





with apparatus, . . .



and from books, . . .



chemistry students train for careers.

The American chemical industry has developed most remarkably in the last thirty years. There are, therefore, many opportunities for chemistry graduates in research laboratories and industries making such things as rubber, plastics, detergents, fertilizers, metals, foods, textiles, and countless more. Nearly three-fourths of all chemists work in such industries. There are also opportunities in government laboratories operated by agriculture departments, the Atomic Energy Commission, Bureau of Standards, and Army and Navy research laboratories. Some chemistry graduates find high school teaching a satisfactory career.

Women are as welcome as men in most of these jobs. There is even a special professional organization for women in chemistry. Some girls find they prefer chemical library, literature or writing careers.

The best opportunities, of course, go to graduate students with master's or doctor's degrees, and this is particularly true of research or college and university teaching jobs. If you do well as an undergraduate chemistry student, you will probably be encouraged to stay in school, either at SUI or elsewhere, for this advanced work. But there are plenty of interesting opportunities waiting for those with only bachelor's degrees.

GEOGRAPHY

The study of geography deals with the uneven distribution of phenomena over the earth's surface. In nearly all cases, it is not possible to explain this unevenness in any ordinary way; hence, a set of methods and techniques has been devised to accomplish these explanations. The applications of these methods and techniques to the study of the spatial arrangement of natural, economic, social, and political phenomena constitute the methodology of modern geography.

As a geography major you will discover that the study goes far beyond the usual concept of geography as a collection of facts about different parts of the world. The present concern of geographers is with the analysis and explanation of the spatial structure of phenomena, carefully measured and scientifically studied. On the basis of their work, modern geographers hope to demonstrate pertinent principles governing the spatial relationships of specific features, and in this manner provide a basis for considering the solution of many local, state, national, or international problems. As scientists, geographers are no longer content to deal only with the encyclopedic description of areas, but attempt to organize their knowledge into some kind of meaningful general theory.

The science of geography may be subdivided into at least four major branches: physical, economic, social, and political. Physical geography is concerned with the distribution of natural phenomena—land forms, climate, soils, minerals, surface and underground water, plants, and animals. Economic geography deals mainly with the production, distribution, and consumption of goods and services and includes the study of the spatial structure of

Processing facts, . . .



farming, manufacturing, mining, commerce, and so forth. Political geography is concerned with the spatial expressions of political institutions and behavior, including such phenomena as the nation-state, voting patterns, international cooperation and conflicts. Among other things, social geography deals with the distribution of population, rural and urban settlements, and the spatial diffusion of cultural traits. Work in each of these branches of geography prepares you to deal more effectively with many of the problems of our changing society.

As you may have surmised, spatial distributions of phenomena can best be portrayed on maps, and the degree to which two or more phenomena are areally associated can often be suggested by comparing maps on which the spatial patterns of the factors included are portrayed. Hence, though many other disciplines use maps more or less incidentally, in geography they have become the one constantly essential tool. Recently, geographers have begun to adopt statistical and mathematical techniques in an attempt to lend greater precision and exactness to their findings. However, maps continue to serve many purposes in geographic study, and they aid in the graphic presentations of spatial relationships. In your study of geography, you will want to become proficient in making and using maps.

As a geography student at SUI you will first be introduced to the concepts or notions common to the spatial distribution of all phenomena. For example, you will consider such notions as areal extent, areal association, spatial interaction, and spatial diffusion. The last notion, for example, is particularly adaptable to the study of migration, such as the analysis through time and over space of the spread of ideas, artifacts, and people. The notion of areal association, on the other hand, indicates the degree to which one spatial pattern duplicates some other. As you deal with each of these notions and concepts, you will be introduced to selected mathematical and statistical techniques useful in their analysis.



studying maps, . . .



and making field observations, . . .

Later, you will elect courses in each of the principal branches of geography, including the Geography of Physical Resources, Economic Geography, Political Geography, Social Geography, and Urban Geography. You will also take courses in Maps and Map Interpretation and in Field Techniques. This last course will help you gain technical skills in the collection of field data in urban and rural areas, and in sampling procedures. If time permits, you may want to elect an advanced course in one or two of the branches of geography which may interest you most.

At the same time you will be taking basic courses in geology, economics, sociology, and political science in accordance with your academic and professional interests. You will also be required to complete either a college-level course in algebra or an introductory course in statistics in order to handle the quantitative aspects of geographic studies.

Majors in geography prepare to assume professional duties in many governmental agencies and industrial and commercial concerns where there is a demand for persons capable of analyzing the distribution of resources, economic development, urban functions, and the areal associations of phenomena in the world as a whole or in major parts of it. Such agencies include conservation services and city planning boards, as well as transportation firms, publishing companies, and firms studying market areas. In addition, the teaching profession provides an important outlet for many geographers. Colleges and universities are expanding their offerings in the field and require additional staff members. The same can be said for the elementary and secondary schools of our country. A number of large city school systems have recently added courses in geography to their curricula and are seeking qualified persons to teach this subject. It should be noted, however, that relatively few job opportunities outside of teaching in elementary or high schools are available to persons with the bachelor's degree. It is wise, therefore, to obtain a master's or doctor's degree in the field before looking for a job. You



geography students acquire proficiency.

may do your work for both at the State University of Iowa. Graduate training vastly increases your qualifications for a greater range of positions.

The Department of Geography at SUI is well equipped for both graduate and undergraduate study. New facilities include a cartographic laboratory and special drafting workrooms. More than three hundred wall maps, including many printed abroad are available, as well as a variety of projection equipment employing the most recent developments in visual instruction. The map library includes more than 50,000 maps of foreign and domestic areas and is a depository for all the geologic and topographic maps published by the United States Geological Survey. The University Library is also a depository for U.S. government documents and includes a large volume of materials on foreign areas. The Department of Geography is well equipped with modern devices for reducing, enlarging, and drafting all types of maps, and maintains a special laboratory housing statistical equipment for use by students. Graduate and undergraduate students enjoy the benefits of special lectures and seminars, and a local chapter of Gamma Theta Upsilon, a national professional organization.

GEOLOGY

Geology is the science of the earth, a subject as big and varied as the earth itself. In two billion years our sphere has seen a lot of history, and it is the geologists' job to reconstruct and recount that story. Sizzling rocks and clouds of steam cooled to form lands and oceans; then mountains, plains, volcanoes, rivers, mountains again, more volcanoes, and finally glaciers. And through this story is interwoven another—the gradual coming of life in the oceans and then on land. To this remarkable history we are today indebted for the minerals and ores we mine; the coal and oil we burn; and the soil we farm.

So earth history is big and complicated, and geologists have divided their science into more convenient bites. Thus *mineralogy* is the science of minerals; *petrology*, the science of rocks; *paleontology*, the study of fossils and life history; *geomorphology*, the earth's land forms

and scenery; *structural geology*, the architecture and structure of the earth; *historical geology*, its origin and history; *meteorology and climatology*, its weather and climate; *oceanography*, its oceans; and *economic geology*, the origin and location of natural resources, especially ores and fuels.

Geology is a young science, still rapidly changing, growing, and developing. Yet geology has already become an important and practical science. More than half of the geologists now graduating from colleges and universities find work as petroleum geologists and geophysicists—economic geologists, exploring for gas and oil and supervising test drillings. The U.S. Geological Survey is famous for its maps and studies of resources; "Surveys" in forty-seven states, too, employ many geologists. So do other federal bureaus; Army Engineer Corps, Reclamation and Soil Conservation Services, Bureau of Mines, Atomic Energy Commission, and others. Geology teaching is largely restricted to the universities with well-developed departments, since little attention is given to the subject in most high schools or junior colleges.

The first stage in studying geology at SUI is the regular four-year undergraduate course leading to the bachelor's degree. This includes basic courses in earth science and special training in geologic mapping, paleontology or crystallography, mineralogy, and petrology. Outside requirements, in addition to "core courses," are chemistry, mathematics, physics, and zoology. Courses in astronomy, botany, and geography are recommended.

The science of the earth, . . .





with its composition, . . .



structure, . . .



history, . . .

The field of geology is so wide and complex that most people cannot acquire enough background material and specialized training in four years of college. The federal bureaus, the state surveys, the oil companies, and the universities all look for those who have had at least one more year of training. This means that those who hope to become geologists should plan on at least five years of college, the last year of which is graduate work for the master's degree. This includes more advanced courses in geology and in at least one other related field, the preparation of a master's thesis, and written and oral examinations.

The third and last stage in geology training involves about two years beyond the M.S. degree and leads to the Ph.D. This stage is not necessary for most public or commercial work, but the doctor's degree is practically required these days for all college and university teaching.

What sort of life does the geologist lead? The American Geological Institute describes it in these words:

"He often explores the wilderness of little-known areas of the earth in the search for oil or other minerals, or in carrying on his research. He often combines a rigorous outdoor life with office or laboratory work in the city. He may delve into the depths of the ocean; study the action of volcanoes; advise on the construction of dams or highways; help to write laws governing the mining of minerals in foreign countries; or carry on the most basic type of research in the laboratory. He has sound and broad scientific training, and is often a businessman



and formation, . . .

at the same time. Because he works often with the unknown, he must also possess a good scientific imagination and the ability to make sound scientific guesses."

Geology students at SUI get at least one summer's practice in field work, during an eight-week field course in the Black Hills of South Dakota. This work is required for graduation, and some students go on several of these annual trips. Shorter visits to points of special interest nearer Iowa City are common throughout the school year.

Men greatly outnumber women in geology, partly because of the nature of field work. However, the oil companies and the government agencies all employ some women geologists, and there are many chances for women to teach in colleges and universities.

is the geology student's field of study.





Using modern computing machines, . . .

MATHEMATICS

Mathematics, in the minds of many people, is a tool which is capable of producing almost unbelievable results when placed in the hands of a competent physicist, chemist, or engineer. Like many popular ideas about the sciences, this conception of mathematics has merit; but it represents a point of view that is much too restrictive. Mathematicians are justifiably proud of the fact that their subject serves as a universal language and a tool for all the sciences; but they derive far more satisfaction from the fact that mathematics is an independent intellectual discipline that contributes much to a liberal and cultural education. Each year it takes literally thousands of pages to print the new mathematics that has been developed.

At the State University of Iowa, the Department of Mathematics offers various programs of study that lead to the B.A., M.S., and Ph.D. degrees. The undergraduate program naturally has in it courses that are designed to meet the technical needs of students of the other sciences; however, the primary purpose of the program is to provide training in mathematics itself. The graduate program is so arranged that a student may take his work in any one of four divisions: mathematics (pure and applied), mathematical statistics, the teaching of mathematics, and actuarial science. With the possible exception of the specialized program in the teaching of high school mathematics, graduates of any of these programs have a

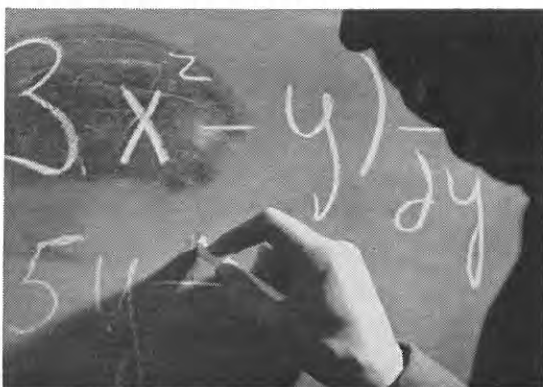


comprehending basic concepts, . . .

wide variety of choices of a career. They may take positions in government, in industry, in an insurance company, or, as many do, they may become teachers or research workers in a college or university.

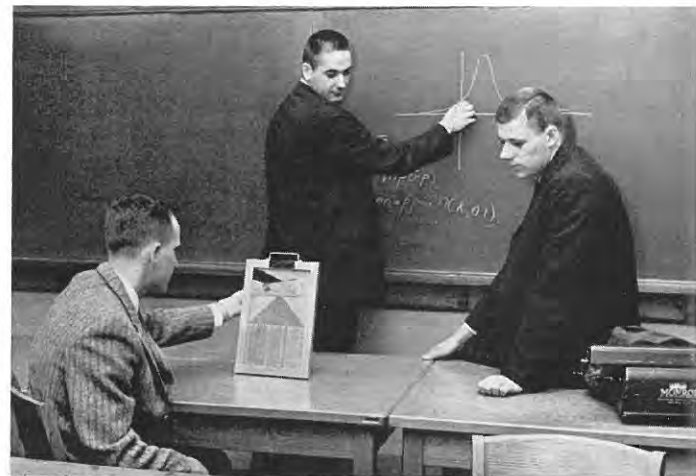
If you find that you like algebra and geometry and if you are "pretty good" in these studies, it may be that your future lies in mathematics. But if you have such a notion, be sure to take all the algebra, geometry, and trigonometry that you can get in high school. At present, most of the freshmen who take mathematics at the State University of Iowa begin with a course in algebra, or algebra and trigonometry. Many of us think this is a mistake. A

mastering operational skills, . . .



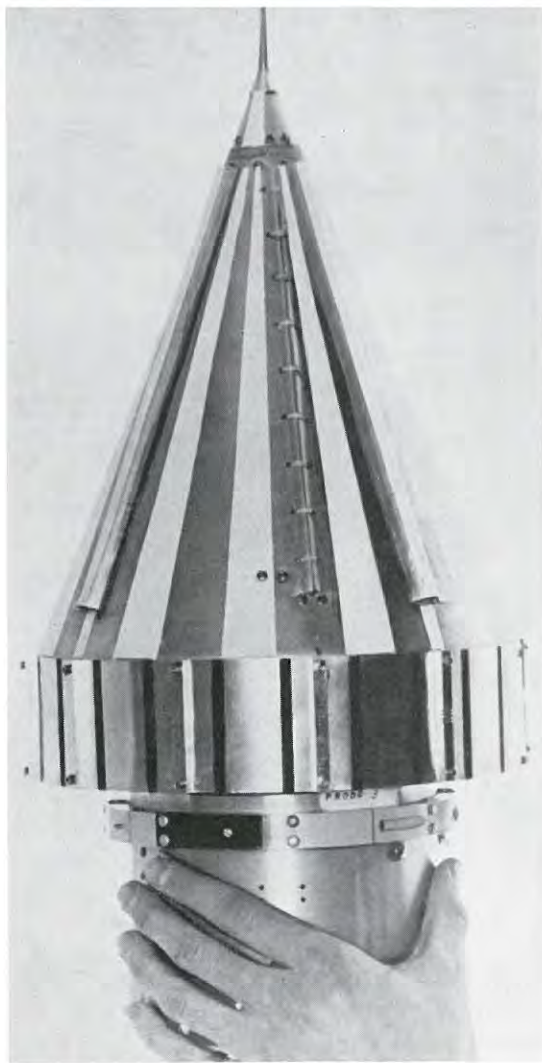
number of our high schools now offer a sufficient amount of algebra and trigonometry so that if you would "dig in" there is no reason why you should not begin your college mathematics with analytic geometry. By so doing, you would get a taste of calculus in your freshman year. Because most students do not really know whether they wish to major in mathematics until they have had some calculus, this could save a lot of time. And time is one of the few commodities that cannot be bought.

In addition to the general requirements of the College of Liberal Arts, the candidate for a B.A. degree in mathematics must take at least 27 semester hours of mathematics beyond the level of college algebra and trigonometry.



students discover the world of mathematics.

His program would include a semester of analytic geometry and a year of calculus. In addition to these he would probably take courses in advanced calculus, differential equations, elementary abstract algebra, matrix algebra, and statistics. Upon completion of this program he would be qualified for a variety of technical jobs in business and industry, and would also be prepared to undertake graduate study in mathematics.



In the challenging Age of Space, . . .

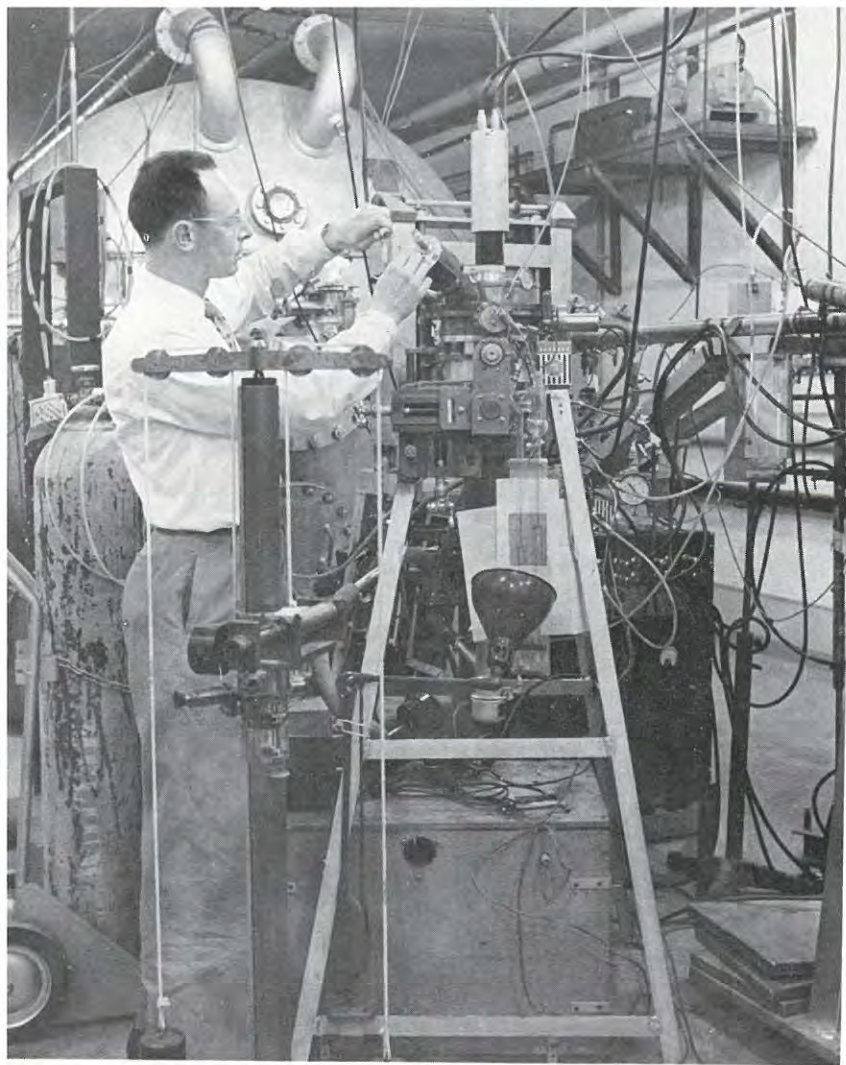
PHYSICS AND ASTRONOMY

Physicists and astronomers study the structure and the dynamics of matter and energy—from particles within atoms to stars within galaxies. That the same physical laws apply to both atoms and stars is remarkable. That human beings have been able to develop their resources to the point of understanding some of these laws is even more remarkable.

Broadly speaking, physics divides into the work of the theorist and of the experimentalist. The former interprets, organizes, and suggests new experiments, using such tools as logic,

mathematics, intuition, and knowledge of the experiments. The latter observes, tests, and analyzes data from the many instruments and techniques which ask questions of Nature. Theoretical and experimental cooperation create new knowledge, often leading to useful and momentous applications.

Perhaps the best measure of the impact of physics and astronomy in our times is that the mid-twentieth century is most notably the Age of the Atom and the Age of Space. World War II was dubbed “the physicists war.” After radar



using highly complex equipment . . .

and nuclear fission came transistors, radio astronomy, satellites, and a host of other major applications.

In some of these developments—notably with radiation detection and particle identification from satellites and deep space probes—the State University of Iowa Department of Physics and Astronomy has played major roles. Logically and conveniently these related fields share the same department at the University, the only state institution in Iowa which grants degrees in astronomy.

Physics and related studies currently advance so rapidly that a freshman this year may graduate into a career field which does not now exist. So the physics major has the more reason to ground himself in the fundamentals of his field—the better to prepare himself for new developments.

As he advances in his program at SUI the physics major may work with a Cockroft-Walton accelerator of 400 kev, or with a four mev Van de Graaff. He may operate shock, radiation, or environmental test chambers or other electronic apparatus connected with the preparation and reception of space instruments. Astronomy majors use a 5-inch telescope atop the Physics Building and a 12-inch one out in the country away from the interference of artificial light.

When you study at SUI for a bachelor's degree in physics, you take a general introductory course in physics, a course in atomic and nuclear physics, and courses in analytical mechanics and electricity and magnetism. The requirements, beyond these, are flexible enough so that you can build whatever foundation your future plans suggest. Physics students take at least one course in chemistry and several semesters of mathematics—and, of course, the usual "core course" requirements in other liberal arts departments.

With a bachelor's degree in physics you should be able to teach high school physics and mathematics, or to work in a government or industrial laboratory in such fields as precision measurement, electronics, mechanics, or nuclear physics.

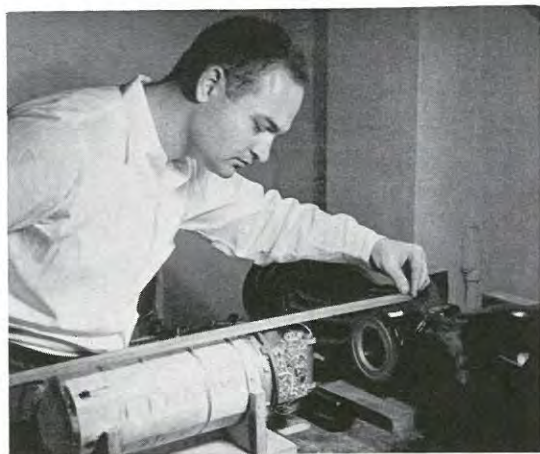
As in most sciences, however, better opportunities await those with more years of college work. At SUI there are three graduate degrees in physics:

and exacting techniques, . . .

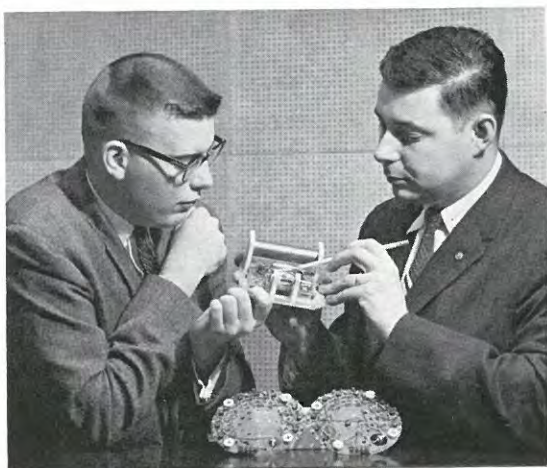




physicists explore the mysteries . . .



of our planet and, . . .



with astronomy, are reaching . . .

M.A.—a general program in three semesters of graduate work, for those who want broader training, especially for high school and junior college teaching.

M.S.—a specialized program of graduate work for those who plan to take Ph.D. degrees or who seek industrial or government research jobs.

Ph.D.—the professional program, requiring two or three years of advanced study and original research after receiving the M.S. degree. A doctor's degree opens the full range of satisfying and rewarding careers in physics.

If you hope for a career in physics, begin by getting as much preliminary training in science and mathematics as your abilities and circumstances allow. When you are ready for advanced work, you can expect to work as a physicist and so earn many of your graduate expenses.

Students intending to concentrate in astronomy should also endeavor to get as much prior preparation in mathematics and science as is practicable. In addition to the undergraduate major, the department at SUI offers a program of advanced study leading to the Master of Science degree in astronomy.

Graduates with specialized training in astronomy are qualified for many positions in observatories or with the government, as well as for a variety of industrial jobs that require their scientific ability. In this era of space exploration, such opportunities are multiplying. Those going into teaching often give courses in mathematics or physics along with astronomy.

into the universe beyond.



PSYCHOLOGY

Scientific method has been used in the study of human behavior for less than 100 years. During that time the State University of Iowa has made many major contributions to the measurement of reaction-time and motor skills, tests of musical and art aptitude, how learning takes place, how persons perceive form, and techniques for the measurement of attitudes and public opinion.

Since it is one of the youngest of the sciences, there is still much to be learned. As in any science, psychologists acquire a great mass of facts by careful observation and experimentation. These are then related to each other and simplified with the development of general laws or principles—scientific theory. If psychology is as successful in developing a general

theory of behavior as, for example, physics has been in its area, we should expect psychology to contribute as much to human happiness as the natural sciences have to our material welfare.

The science is divided into two general areas: *general*, *social*, or *experimental* psychology, as described above; and *technological-clinical* psychology—the application of facts and principles to practical problems. Examples of technological psychology would be choosing people for the right job in a factory and providing incentives to more effective work. An example of clinical psychology would be studying the problems of an unhappy and confused person to get at the source of his trouble and to remove it.

Psychology students study the problems of human behavior with the aid of . . .





animal experiments, . . .



scientific tests, . . .

The Department of Psychology at SUI is nationally known for its undergraduate and graduate programs of training and research in the fields of general psychology. It is one of the departments in the country recognized as having outstanding programs designed for the training of clinical psychologists, and many graduates have been successful in personnel and industrial psychology.

At the present time, and for the predictable future, there is a shortage of well-trained psychologists. Government, the armed services, business and industry, health services, and educational institutions increasingly are using the

methods of psychology. As our society becomes more and more complex, the methods and research findings of the psychologist increase in demand. And, as the United States becomes stronger in war or peace, psychology, as the science of behavior, will be expected to provide many of the services and much of the research enabling people to attain maturity as citizens and greater effectiveness as workers.

Many outstanding facilities are available for research and training at Iowa. There are specially equipped laboratories, including a newly designed motor skills laboratory, as well as a general experimental laboratory. A complete electronics shop, under supervision of an electronics engineer, provides accurate apparatus essential to carefully controlled research in human behavior. Special types of scientific equipment are built in the department.

An excellent library provides students and faculty alike with easy access to books and publications in the field.

Each year the department trains graduate students under auspices of the United States Public Health Service and the Veterans' Administration. At present, the department also cooperates with the Human Resources Research Center of the U.S. Air Force in research

and technical apparatus, . . .





in adults . . .



and children, . . .



under the guidance of expert instructors.

on perceptual and motor skills, and conducts research projects with the U.S. Navy and other federal agencies.

A counseling service is maintained to aid students in diagnosing and remedying personal problems and in providing a testing service helpful in ascertaining their special aptitudes and vocational interests.

Speech pathology, organized as a separate department, works closely with psychology and has achieved a national reputation in the diagnosis and treatment of speech disorders, from stuttering to more serious speech difficulties. Similar close working relationships are maintained with the Child Welfare Research Station.

The clinical training program prepares students for work in hospitals, clinics, federal and state agencies, and various research organizations. The department has outstanding facilities for both academic and theoretical training and for practical training in hospitals. Cooperating with the department are the Psychopathic Hospital, the Student Counseling Office, the Children's Hospital, and the Veterans' Administration Hospital, all on or near the campus.

After completing work for advanced degrees many graduates accept positions with governmental organizations as civilians or as officers in the armed services. Other graduates enter the professions of college teaching, clinical psychology in its various branches, or industrial and personnel psychology. Some, too, do psychological and related work in state civil service organizations. The experiences students-in-training obtain at the University enable them to enter many types of fields for which their studies are indispensable.

ZOOLOGY

Zoology is for animals, what botany is for plants: how they begin, what they are, how they grow, and what they do.

This is a big subject. There is so much known today, and so much to be discovered tomorrow, that it is impossible for one man to know all things in zoology. A student, therefore, usually specializes in one of the major areas of the total field. Some zoologists, for instance, study how animals function and stay alive (physiology); some study how animals live together (ecology); others how they inherit (genetics). Some animals are parasites, and a special branch of zoology, called parasitology, is devoted to these. Entomology is the study of insects, embryology the reproduction and birth of young, and protozoology the study of the tiny, simplest, one-celled organisms.

The courses offered in the Department of Zoology at SUI make it possible to concentrate in one of ten major areas: physiology, anatomy, embryology, ecology, histology and cytology, parasitology, genetics, entomology, protozoology, and invertebrate zoology.

The fundamental methods that a worker must use in any of these inter-related areas are those which qualify him as a scientist. One is not a scientist because he has acquired knowledge, although an understanding of the elemental structure of the materials in the world is vital to a student's understanding of zoology, demanding a good knowledge of

Probing the secrets of nature . . .



chemistry and physics. The student must also be able to express, observe, and measure accurately. This demands a good knowledge of mathematics. The student must also develop habits of honesty, industry, diligence, and a humble curiosity toward the very complex world in which we live.

Just as the areas within zoology are inter-related, the boundaries of the science as a whole touch upon and overlap neighboring sciences. At the uppermost level, for instance, studies of animal populations blend with the field of sociology; at the lowermost level, studies of structure and function enter the fields of chemistry and physics. And, finally, the foundations of medical science rest upon all these branches of zoology: the latter pointing out the solid grounding in zoological science that is a "must" for the student planning to enter medicine or dentistry, and almost equally desirable for students of sociology and psychology.

As a zoology student at SUI, you will prepare for one of three professions; teaching of zoology, basic research, and applied zoological science. As a basic researcher, you will be

with powerful microscopes, . . .



examining many forms . . .



of animals, . . .

working at the frontier of human knowledge, attempting to acquire more information and understanding about the processes which support living things. Many research zoologists find theirs a challenging science simply because it leads them to study fascinating things about which man does not know. As an applied scientist you will be concerned with the use of this information and understanding in creating machinery, processes, and materials which contribute to a more efficient utilization of the world in which we live—new farm varieties and methods, better vaccines, more control of human and animal parasites, new ideas of how animals, wild and domestic, can live together.

In all of his zoological courses at Iowa, both laboratory and field study, the student makes firsthand contact with his subject matter. Laboratories are completely equipped with all necessary optical instruments; there is a full range of living animals and specimens preserved for dissection; and both classroom and laboratory enjoy the advantages of supplementary illustrative material in the form of models, special dissections and skeletal preparations, charts, lantern slides, and motion pictures.

There are jobs open for bachelor's degree graduates who have finished this four-year zoology major: work in the Public Health Service, Food and Drug Administration, and the Animal Science Division of the Department of Agriculture; testing or laboratory work in pharmaceutical industries, hospitals, and medical foundations; wildlife management and naturalist in parks or reservations; and a few teaching opportunities. But most careers in zoology require the greater knowledge and specialization which comes with graduate work for M.S. or Ph.D. degrees. In this case the opportunities after graduation are considerably multiplied—including teaching and research in colleges and universities, research for various government agencies, and research or management in industries concerned with animal products and human or animal health.



as well as human beings, . . .



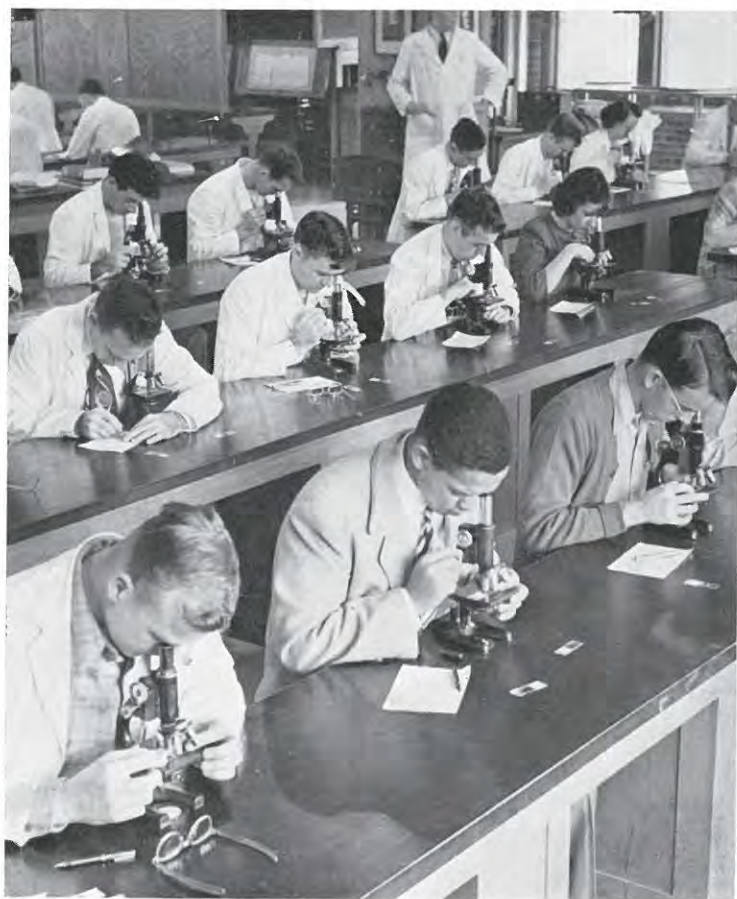
zoologists pursue the study of animal life.

GENERAL SCIENCE

General Science is a special major at SUI, designed for students who want to prepare to teach science in secondary schools. Some others, however, including some who are preparing for medical or dentistry careers, have found this broader foundation in many sciences a valuable training.

Students in general science may select courses in botany, chemistry, geology, mathematics, physics, and zoology—at least four courses from one department, two courses from each of two other departments, and others on an optional basis to fulfill graduation requirements in the College of Liberal Arts. However, if the primary goal is a certificate to teach in secondary schools, additional science courses are necessary. A choice between the biological and physical sciences is needed for purposes of specialization. A total of 28 semester hours of course credit in either area is a minimum requirement, with 18 hours being required in the other area. In addition, a minimum of one course must be selected in the area of earth science. A teaching minor in mathematics is recommended. Several professional courses in education are also required for teacher certification. The student who is preparing to teach has a complete schedule if he is to complete the liberal arts “core,” the science major, the mathematics minor, and the education requirements. Since there are many decisions that must be made regarding a four-year program, it is important to consult the special adviser to general science students.

Science Education is an important graduate major at SUI. Programs for master's and Ph.D. degrees exist for persons interested in teaching the sciences in large secondary schools and colleges as well as for those interested in supervising science programs in various cities, counties, and states. Such programs entail close cooperation among all science departments.

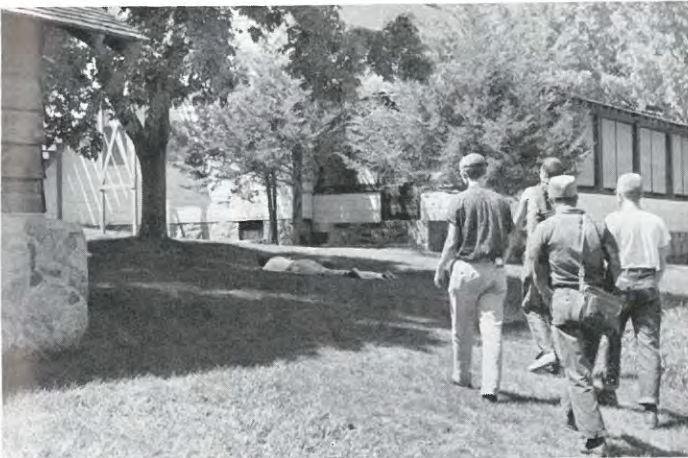


The general science student has the opportunity to satisfy his desire for knowledge and skills in several areas.

IOWA LAKESIDE LABORATORY

Located on the shore of West Lake Okoboji in the lake region of northern Iowa, the Iowa Lakeside Laboratory offers summertime opportunities to graduate and undergraduate students who wish to supplement their classroom biology with field work.

Courses in field biology, aquatic biology, and plant and animal taxonomy supplement on-campus courses in ecology.



The favorably located facilities and living quarters of the Lakeside Laboratory . . .



enable students and research workers to study plant life under natural conditions.

FOR MORE INFORMATION

If, after reading this booklet, you still have questions about any phase of study in the various science departments at the State University of Iowa, please address a card or letter with your questions to the Dean of Admissions, State University of Iowa, Iowa City. Requests for application for admission, housing forms, or general information about SUI also may be addressed to the Dean of Admissions.



The enormous amount of data used in modern scientific investigation is processed with spectacular speed by electronic computers.