THE NUCLEAR ENGINEER at MICHIGAN

As the atomic age becomes a thing of the present and not the future, nuclear engineers are becoming more and more important.

by DIANA ARMINTROUT, '61E

Since the discovery that the nucleus of the atom holds a vast storehouse of power, innumerable applications have been made of this energy. Men of science in all fields have pooled their resources in finding new uses for it, obtaining more knowledge about it, and applying the knowledge that they now have in the advantageous use of it. This has created a large demand for people in all phases of engineering and science with the ability to work with this power.

Reactors must be designed and facilities constructed to both handle the radioactive materials and utilize the power obtained from them. This falls into the realm of engineering, for it is the engineer who must carry out these essential operations. In view of this, the University of Michigan, along with several other schools in the United States, has established a nuclear engineering degree program.

The field of nuclear energy requires the talent of all types of engineers. Electrical engineers are needed to design the complicated electronic mechanisms which are an integral part of the reactor's system; Metallurgists are needed to develop new materials for the facilities; and chemical engineers are needed to extract the fuels, as just a few examples. Teams of men from all branches of the engineering profession work together in order that this new tool shall serve man. Since many types of engineers are necessary to the development of atomic power, the University of Michigan has not found it advisable at this time to introduce an undergraduate program in nuclear engineering. Therefore, the program is now confined to the graduate level, with Master of Science in Nuclear Engineering, and Ph.D. degrees being offered.

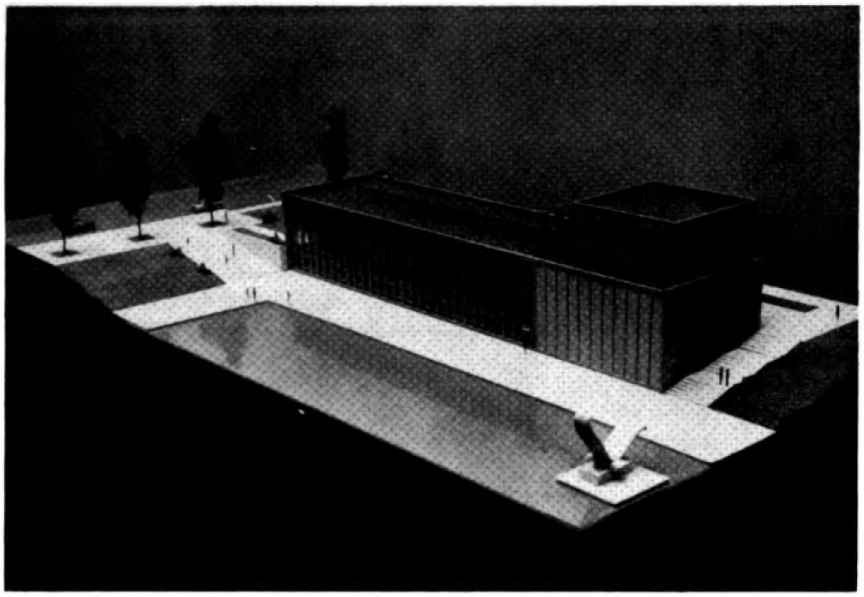
The curriculum at Michigan, although small, is the largest and best equipped of its kind in the United States. This year there are about 100 graduate students in the department who are working towards degrees, and another 100 students who are taking some of the courses which are offered, but do not intend to earn degrees in the program. The department, headed by Professor Henry J. Gomberg, also boasts a staff of 16 which is working full or part time in the program.

Compared to the other programs offered by the University of Michigan, this may seem limited in size. However, it must be remembered that the fact that the University has the responsibility of training men to be both able and competent in a highly complicated field necessitates a small, selective group. It is willing to accept graduate students with any recognized engineering degree, but the achievement level must be high. Rather than expand the program, the University feels that it is in the best interest to allow it to remain the size that it is now. Hence, it will in all probability become more competitive as time goes on considering that interest in the field increases each year.

The entire field of nucleonics is relatively new and so it is with this department. The first courses were offered in 1947, and it continued in this manner

Diana Armintrout, author of "Nuclear Engineering at Michigan," is a recent addition to the articles staff of the *Technic*. A freshman, Diana graduated from Allegan High School, Allegan, Michigan, where she participated in many activities including Student Council, school newspaper, yearbook, Pep Club, Latin Club, and Tri-Hi-Y.

Diana says she has many interests and hobbies but particularly enjoys painting, cooking, sewing, and horseback riding. For the future Diana is working towards B.S. degree in Chemical Engineering with the possibility of a future in technical writing.



ıerial view of the Phoenix Project
ɜ form of an architects model from
ı the building now functioning on
ɳ Campus was built.

1952 when the degree program was
ally organized.
ɔst of the department's facilities are
ıe newly developed North Campus.
in the Phoenix Memorial Building
he Ford Nuclear Reactor which was
nto operation in 1956. This reactor
; with many other facilities, is avail-
for student use. These enable the
ɛrsity of Michigan to offer more
ıment for the use of students than
ɔther school in the United States. A
level cobalt radiation source is pro-
for deeper studies into the secrets of radiation. Caves equipped with huge but delicate remote controlled "hands" handle the intensely radioactive materials. Chemistry laboratories are available for the study of moderate and low activity materials, and other laboratories are provided for the purpose of instrumentation and measurement. Soon, the department will have an analog computor for the solving of complicated problems. There is no other school in the United States where students have before them such a wealth of equipment with which to obtain the knowledge and proficiency required of a good nuclear engineer.

It is important that students in a curriculum such as this have the equipment available to them with which they will be working with after they are graduated. A man must know a reactor like the palm of his hand if he is to be able to design an improved model some day. Therefore, it is to his best advantage if he has access to the best tools available for learning, and the University of Michigan has been able to supply him with these.

What will these graduates do with their knowledge once they have obtained their degrees? Some, undoubtedly, will go into the field of designing nuclear reactors. Turning on the power of a nuclear reactor is not like turning on the family television set. The operator must know what is happening every moment in his instrument, and be able to interpret at a glance every slight inflection of a needle. Upon his knowledge of precisely what he is doing, rests his own safety, the safety of not only those in his present vicinity, but nearby areas as well, and millions of dollars. He must be a technician, yes; but he must of necessity also be a shrewd, careful scientist who has an instinctive feel for the power which he is controlling.

In order that there be reactors to provide power, men are needed to design them. The reactors to today are by no means perfect, and so it is a ceaseless job to find ways in which they can be improved — to make them safer, smaller, or less expensive. If planes are to ever fly under nuclear power, the reactors must be smaller and more efficient than they are now, especially where shielding is

Professors Gomberg and Sawyer speculate on the future development of the Nuclear Engineering Curriculum.

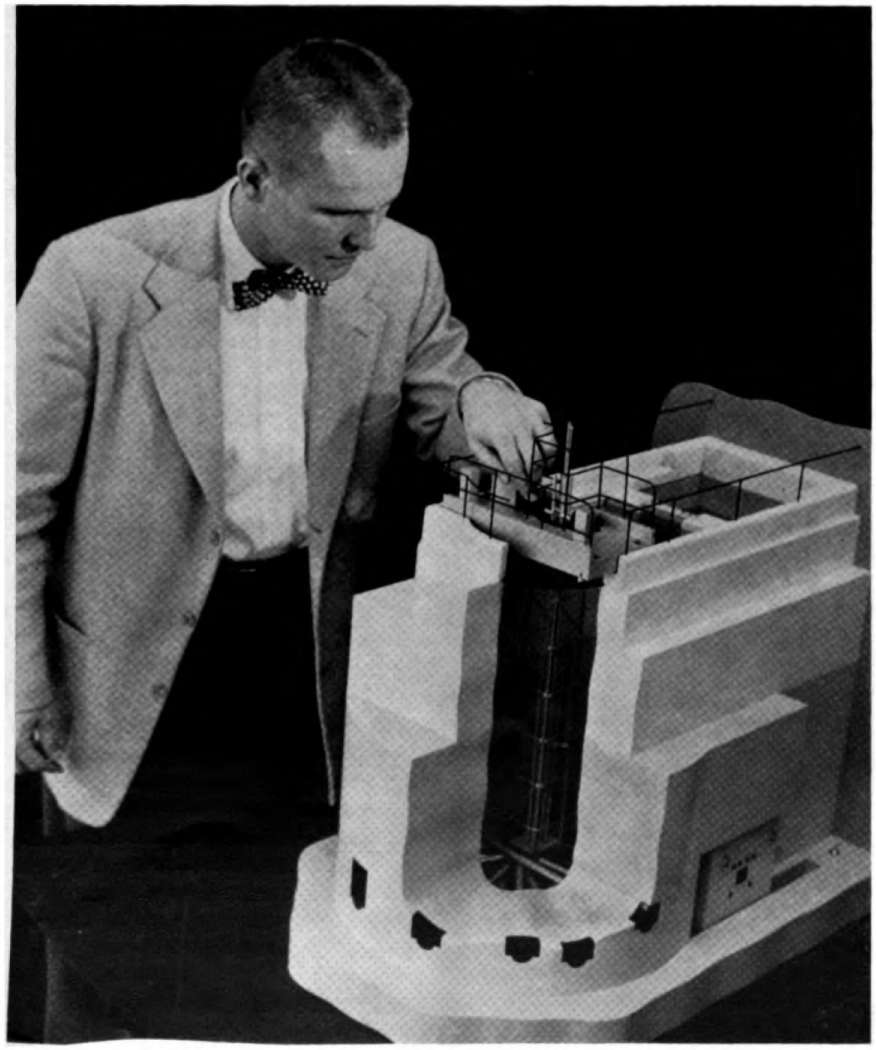
concerned. This is only one broad example of the type of problem facing the designers of reactors. Many little difficulties face them which may be surmounted by the hard, concentrated thinking of designers. A designer must be an exceptional kind of person: one who can work with the theoretical and the practical to blend them into one worthwhile result.

Other men will study the effects of radiation. It is the task of the chemists and biologists to determine exactly what effects the hazardous rays produce, but it is the engineer's job to design protective devices against them. Great depths of water and thick shields of lead are now being used, but more efficient devices may one day be developed by nuclear engineers who seek to alleviate the dangers of the deadly radiations.

The design and construction of radiation facilities is another phase open to graduates in this department. The remote control laboratories must be designed with complicated equipment to protect the personnel. Acquaintance with the source of radiation is required of the designer, as well as engineering skill. A combination of the two is found in the nuclear engineer.

When the University of Michigan graduates an engineer, it is in effect saying that he is fuly capable of operating the necessary devices and handling the materials. This is a grave responsibility. Therefore, the school must be careful to ascertain he has the ability to do this. This makes the requirements difficult to meet, but not impossible. The Atomic Energy Commission is promoting the nuclear engineering programs throughout the country by offering fellowships to exceptional students. A.E.C. money is also being used to assist the colleges in presenting the program. The fellowships give opportunities to students who have the ability to become outstanding nuclear engineers.

Everyone wants "good" nuclear engineers: Not mediocre ones, but men who are capable scientists as well as engineers. The nuclear engineering curriculum at the University of Michigan is small, but it is devoted to the graduation of competent nuclear engineers.



This instructor indicates and describes on a sectional model of the Ford Reactor the various components of the structure.

NEXT MONTH

In the midst of an economic recession that is being felt throughout the United States the *Technic* will present a timely special issue next month entitled—ENGINEERS AND THE ECONOMY. Included in the feast of special articles well be:

An Engineer Goes to Wall Street —What every engineer should and must know before investing his hard-earned savings in stocks and bonds.

Michigan's Industrial Migration —Is Michigan really losing its industry to other states? If so, who's responsible and what can be done to reverse this trend? A Technic editor answers these questions in a hard-hitting report on this pressing problem.

An Engineers First Years — A comprehensive inside look at an engineers first years in industry including such topics as salaries, training programs, advancement, and fringe benefits.

The Future of the Small Business in America—With many an engineer hoping to own his own business someday a *Technic* staffman reports on the advantoges and pitfalls that await him.

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Engineers and the Economy