edited in retrospect

the changing Tech

• Since the last issue of this magazine went to press a great deal has happened at Georgia Tech.

After a 17-month search, the Regents named Dr. Edwin D. Harrison, a 41-year old engineering educator as the sixth president of Georgia Tech. On the same day, June 26, the Regents approved the appointment of Dr. James E. Boyd as director of the Engineering Experiment Station. We have departed slightly from our original plans of an all-ceramics issue of the magazine to bring you a short profile of both of these men. Otherwise, as you can see, the issue is devoted to a report on the ceramics research program now in operation at Tech.

As you will notice in reading this series on ceramics, a great percentage of this research work has been undertaken during the past year. This great increase in sponsored work in ceramics has forced J. D. Walton (see cover) and his group to expand in every direction possible. Today, ceramics work is being carried out in the hallways of the main research building and in a newly erected Butler building in Research Area 2, whch is located on Atlantic Drive a few blocks northwest of the main Tech campus.

Oddly enough, the group's major new contribution, a new and cheaper method of producing fused silica (see article on page 8) was developed using a Rube-Goldberg-type, home-made device in the aforementioned hallway. Which we suppose once again proves the adage that "there is no substitute for the brain of man."

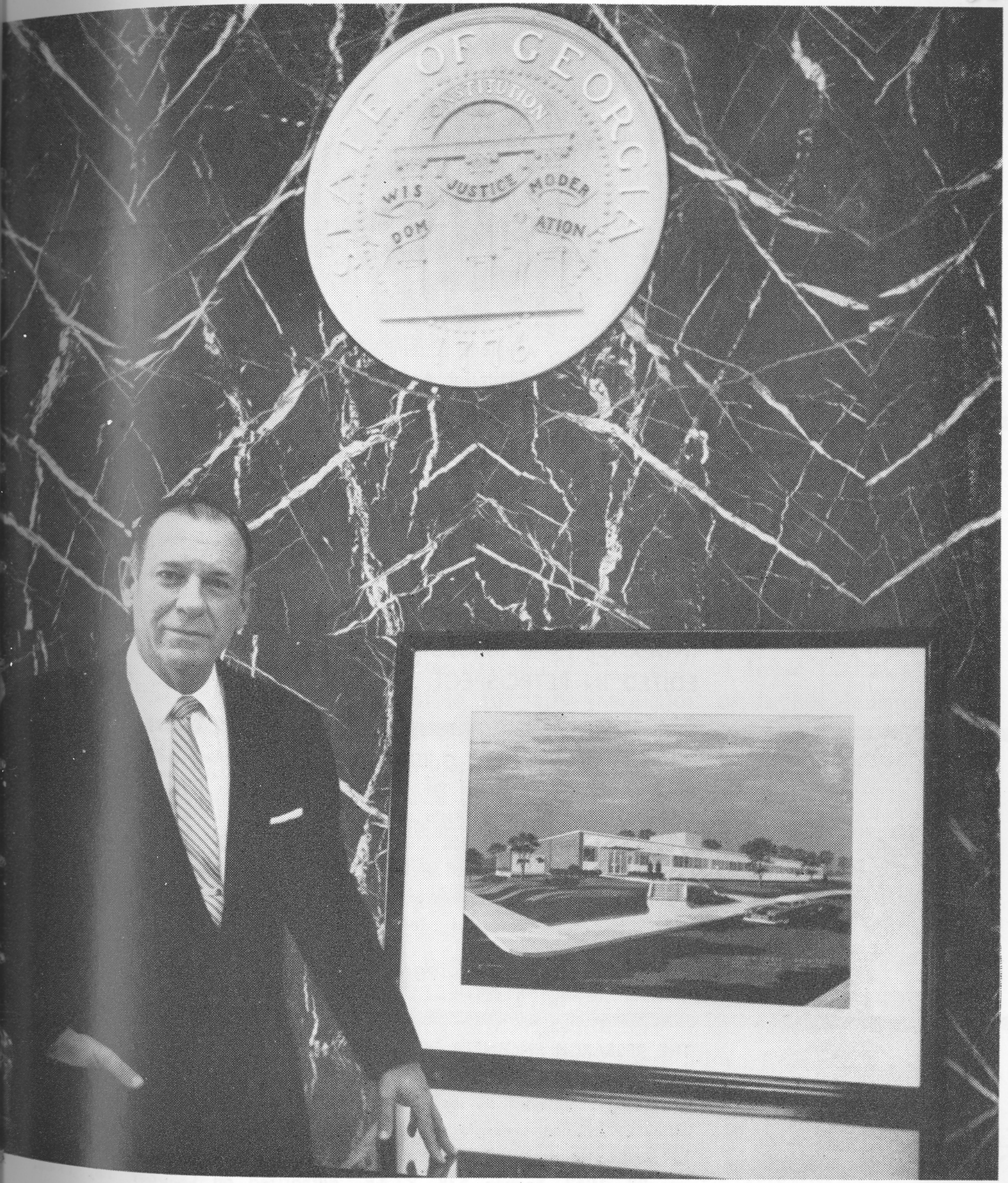
The other important recent event concerning Georgia Tech was the announcement that Governor Griffin had pledged $2,500,000 for the construction of the Georgia Tech Research Reactor. Because of its real news value, this story has also been inserted into this issue of the magazine.

The January issue will be devoted to the third progress report of Tech's nuclear program—providing, of course, that events don't pop during the next three months as they did during the summer just past.

JANUARY, 1958

The Research Engineer

Published by the Georgia Tech Engineering Experiment Station



Governor Griffin and Tech's program
see page 2

SPECIAL NUCLEAR EDITION

The Research Engineer

VOLUME 13, NO. 1 JANUARY, 1958

Published quarterly by the Engineering Experiment Station
Georgia Institute of Technology, Atlanta, Georgia

contents

the cover

Georgia Governor Marvin Griffin more than any other man is responsible for the recent progress of the Georgia Tech nuclear program. His faith in Tech's plans for a first-rate nuclear education and research center was reflected in the grants from State surplus of over $2,800,000 during the past two years to the Board of Regents for Tech's radioisotopes laboratory and research reactor. In back of the Governor is the final architect's sketch of the recently redesigned radioisotopes and bioengineering laboratory.

Cover photograph by Bill Diehl, Jr.

THE RESEARCH ENGINEER is published quarterly, in January, April, July and October by the Engineering Experiment Station, Georgia Institute of Technology. Entered as second-class matter September 1948 at the post office at Atlanta, Georgia under the act of August 24, 1912. Acceptance for mailing at the special rate of postage provided for in the act of February 28, 1952. Section 528, P.L.&R., authorized on October 18, 1948.

The President's Page

The Importance of Being Cooperative

GEORGIA TECH supports wholeheartedly the principle of cooperative use of expensive research facilities. Since the beginning of the Tech nuclear program outlined in the following pages, the needs and interests of other institutions in the region have been considered in the planning of such major facilities as the research reactor and the radioisotopes laboratory.

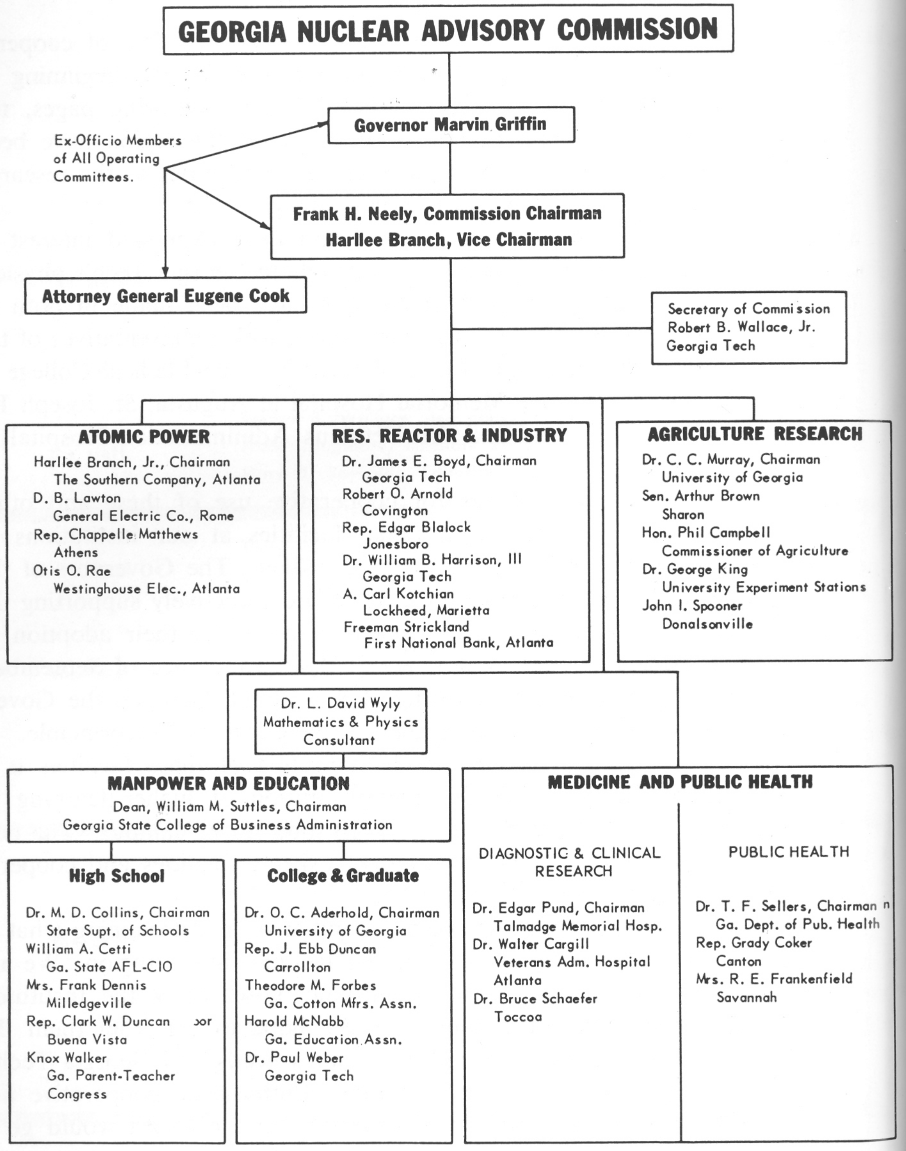
Several institutions in the South have expressed interest in making use of these proposed additions to Georgia Tech's physical plant. And specific design changes have been made in both of these facilities as a result of discussions with representatives of the University of Georgia, Emory University, The Medical College at Augusta, Talmadge Memorial Hospital at Augusta, St. Joseph Infirmary at Atlanta and the Veterans Administration Hospital at Atlanta.

Future possibilities for cooperative use of these and other major research and educational facilities at our institutions of higher learning in the South are excellent. The Governors of the 16 southern states have gone on record as actively supporting the theory of regional use of nuclear activities by their adoption of recommendations to this effect at their conference of September, 1956. At their 1957 meeting at Sea Island, Georgia, the Governors were even stronger in their endorsement of this principle.

Because of the extremely high cost of these facilities it is financially impossible for any institution of higher learning to maintain all of the nuclear research tools on its campus. The best solution lies in cooperative use of existing facilities and cooperative planning for future facilities.

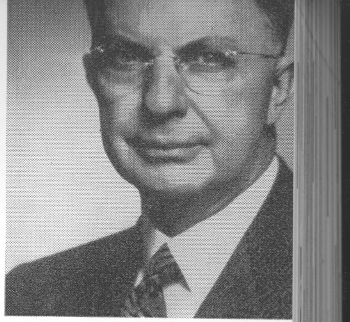
Georgia Tech has taken the initiative in determining what is needed most in the way of nuclear facilities in the region. We are now well on our way in establishing those within the Institute's financial and staff capabilities. We hope to get from them the maximum benefit both for the region's needs and Georgia Tech's educational and research program. Enthusiastic cooperative use of these facilities by other institutions in the South would go a long way toward helping us satisfy these aims.

E. D. Harrison
President.



THE GNAC AND GEORGIA

The Chairman of a new and important State Commission briefs its short History



by FRANK H. NEELY

THE GEORGIA NUCLEAR ADVISORY COMMISSION was created by the 1957 General Assembly under House Resolution 24-50a.

Since its inception, the Commission has had a great deal to do with the speed with which the State has moved towards making Georgia Tech a center of nuclear education and research in the South. At one of the Commission's earliest meetings, it went on record as strongly endorsing the maximum-possible State support for Tech's nuclear program. And at the Commission's August 20, 1957 meeting in Atlanta, Governor Griffin pledged $2,500,000 of State surplus funds towards the cost of Georgia Tech's proposed research reactor. Since that time, members of the Commission along with Georgia Tech personnel have been hard at work trying to secure from Federal agencies the balance of the money needed to erect this magnificent tool of modern science.

The Commission, which numbers among its members outstanding business and industrial leaders, educators, and legislators, is charged with advising the Governor on nuclear energy matters and developing means of seeing that Georgia makes the most of its resources in this field.

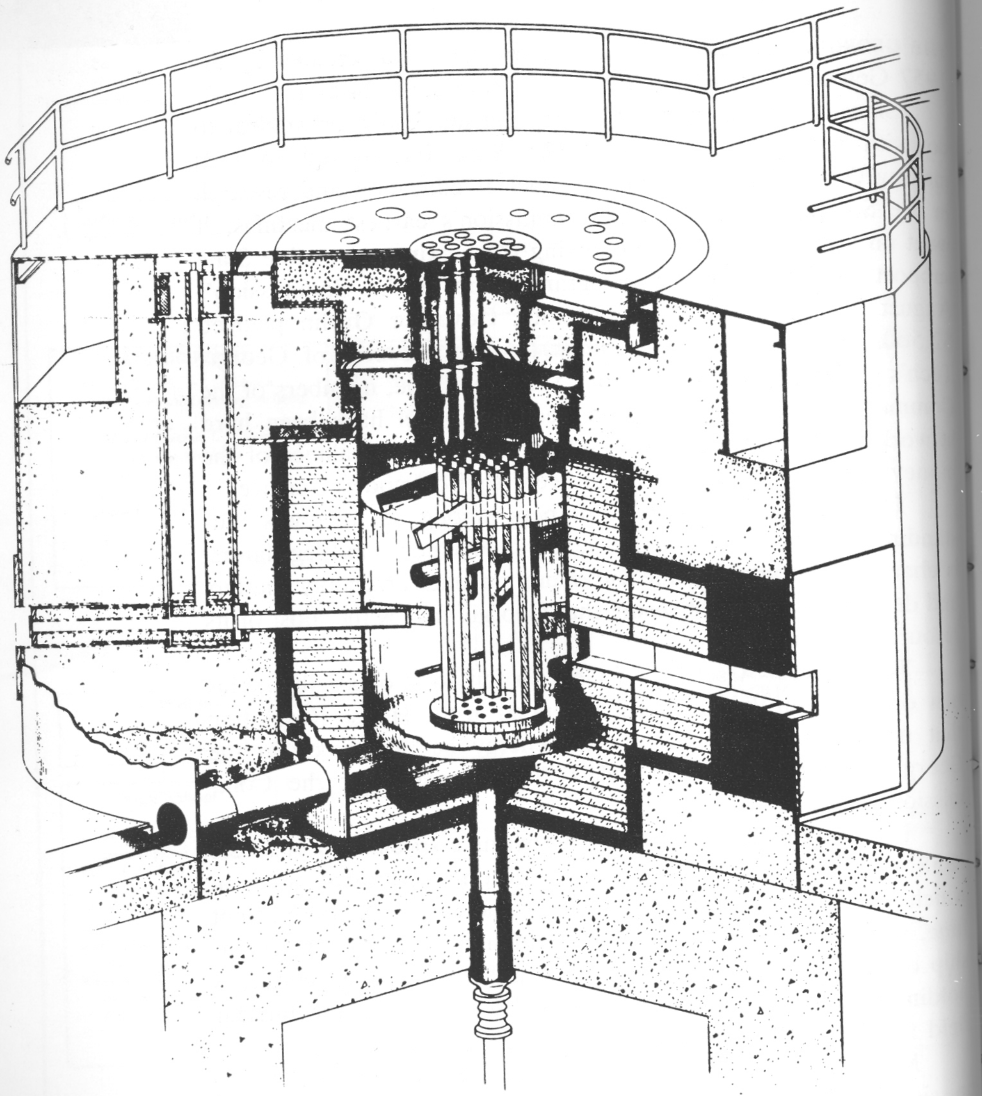
The General Assembly of Georgia felt so strongly about this new organization that they recommended in the House Resolution that no bills pertaining to nuclear energy be introduced in the Georgia General Assembly unless first approved by the Commission.

The Commission is presently preparing a special report to the 1958 Georgia General Assembly suggesting additional ways in which the State may take advantage of the atom. At the present time, a special committee of the Commission under the chairmanship of Harllee Branch, well known Southern power executive, is holding meetings to go over a proposed legislation in the nuclear field for the 1958 General Assembly.

Meanwhile, in order to better advise the Governor, the Commission has kept up to date on developments in the nuclear field through meetings to which national authorities have spoken.

The Research Reactor and Tech

WALTER H. ZINN, A PIONEER IN THE NUCLEAR FIELD, TALKS ABOUT THE NEW TECH REACTOR



GEORGIA TECH. RESEARCH REACTOR
PERSPECTIVE OF REACTOR

IN order to introduce the concept of nuclear reactors, it seems proper to first define a few of the terms which are not in every vocabulary.

Fission is the name applied to the process of splitting uranium atoms. This is the basic process of the reactor. *Neutrons* are very small particles contained within atoms. When a neutron collides with a Uranium 235 atom, it splits the atom. During this process, other neutrons are released, and they can proceed to split other atoms of uranium. This is a *chain reaction* because each splitting event provides the neutrons for producing more similar events.

With the fission process in mind, it is now possible to visualize a *nuclear reactor* as a machine which brings about a self-sustained release of nuclear energy.

The machine consists of Uranium 235 in some form, and, surrounding the uranium, an element of a low atomic number. An element with a *low atomic number* means that, on the atomic scale of things, its atoms have small mass or weight. This material in which the uranium is embedded is usually called the *moderator,* since its purpose is to reduce the velocity of the neutrons which are emitted in the fission of uranium. The moderator slows down the neutrons in the same way in which a billiard ball may lose speed when it strikes another billiard ball.

The fact that a nuclear chain reaction is self-sustaining in a reactor becomes evident because radiation is emitted. This radiation, which is easily observed, consists of neutrons and gamma rays.

Heat also is produced in a reactor, as an inseparable part of the fission of the uranium.

There is a difference

Many people seem to be confused as to the difference between a reactor and an atomic bomb.

Both the atomic bomb and the nuclear reactor are chain reactions of fissionable materials, such as Uranium 235. But any resemblance between them ceases right there.

To make a bomb, very special procedures are instituted, designed to hold the fissionable material together while very high temperatures are generated in it. In order to accomplish this trick, the Manhattan District assembled at the Los Alamos Laboratory in New Mexico, during World War II, the greatest collection of scientific brains the world has seen. The methods used for making sure that the fissionable material stays together in one place, while the very high temperature is generated, are ingenious and complex.

But in a reactor, measures are taken to avoid any circumstance in which extremely high temperatures could be generated. In fact, in nearly all reactors, if any temperatures begin to develop beyond those which are normal, the expansion of parts of the reactor shuts the machine down.

I would like to emphasize that a reactor cannot, by any inadvertance, produce an atomic explosion.

Very early, it was realized that nuclear energy devices would release nuclear radiation. The fact that X rays and the rays from radium would have damaging effects, if improperly used, was well known. Therefore, safety was made an important routine part of all nuclear work.

An outstanding safety record

Safety in nuclear work has not been treated as an afterthought, or as something to be considered only during the annual "Safety Week." This same attitude prevails in the design of nuclear equipment, including the design of reactors. More than 100 reactors have been constructed and operated. Not one has given trouble due to malfunction of equipment. Such accidents as have occurred have all involved mistakes by operating personnel. Equipment failure has, so far, not been the cause of any incident. This fact indicates that the behavior of a reactor, under all circumstances, is well understood, and that the equipment connected with it has been designed with the necessary safeguards to insure safe operation.

NUCLEAR REACTORS—cont'd.

I would like to point out that the atomic energy industry has a better safety record than any other industry of comparable size, both in this country and in England.

The AEC's part in safeguards

According to law, no nuclear reactor can be brought into operation without having it placed under the surveillance of the AEC. The prospective owner and operator of a reactor must obtain a license from the Atomic Energy Commission, which gives him permission to construct such a device. The license is not forthcoming until it has been shown that the design of the proposed reactor meets certain safety standards. The AEC maintains a staff which is expert in the matter of reviewing such designs. Furthermore, approval for a license to construct a reactor is not forthcoming until a committee of experts, called the Advisory Committee on Reactor Safeguards, has reviewed the design and has made its recommendation to the AEC.

Next, the operator of a nuclear reactor must apply for and receive a special permit to obtain fissionable material to put in the reactor. In order to get the fuel material, he must show that he understands the procedures for accounting for such material.

Finally, before he can operate the reactor, he must secure an operating license. And each individual who is permitted to press the buttons on the control panel which start the reactor or stop it, or otherwise affect its operation, must have an individual AEC operator's license. This license is obtainable only through examination.

Usually, the AEC assists in other ways in the establishment of a reactor project, and, especially with regard to research reactors, it may participate in making fuel available at no cost, in arranging for the use of heavy water at no cost, and may actually, if the training of new scientists and engineers is involved, make a contribution towards the construction of the project.

Each nuclear reactor project must make application to the Atomic Energy Commission for any of these circumstances, and each project is considered separately on its merits.

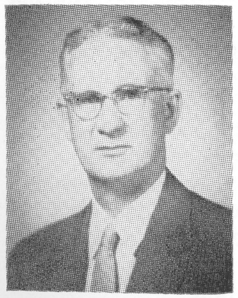
Research and power reactors

The heat produced is utilized in nuclear reactors designed for the production of power, and these are called *power reactors.*

In *research reactors,* emphasis is placed on utilization of the radiation emitted by the fission process. While nuclear radiation can be released by devices which are not reactors, the nuclear reactor is different, in that it releases radiation in quantities greater than can be obtained from other devices, and in a reactor, this release is self-sustaining.

In addition to the different aspects already noted, there are two other major differences between power reactors and research reactors:

First, the amount of heat energy released in a research reactor is very small, compared to the amount which must be released in a fullscale power plant.



ABOUT THE AUTHOR—Dr. Walter H. Zinn

The man who carried out the conceptual design of the Georgia Tech Research Reactor is one of the pioneers of this young field. In 1939 he was the leader of the research group that showed that a nuclear chain reaction was possible. In 1942 he was in charge of construction of the world's first reactor. He is at present president of the General Nuclear Engineering Corp. of Dunedin, Florida.

Second, the power reactor must operate at elevated temperature, in order to produce power. A research reactor operates essentially at room temperature. An example would be a power reactor cooled by water, in which the water comes from the reactor at 600 degrees Fahrenheit. In the Georgia Tech research reactor, the water leaving the machine will be at only 100 degrees F.

Among the many uses of gamma rays and neutrons, the production of radioactive materials called *radioisotopes* has attracted much attention.

Radioisotopes Production

The production of radioisotopes, while an important activity, probably will not be the most important function of the Georgia Tech reactor, with one exception—the production of short-lived radioisotopes. Some radioisotopes have lives that are measured in hours, minutes and seconds. Until the Tech reactor goes to work, the closest source of radioisotopes for Georgia is Oak Ridge, Tenn. Obviously, it is impossible to transport an isotope with a life measured in minutes, or perhaps an hour or two, from the laboratory there to Georgia. Thus, the special value of the Georgia Tech reactor in the production of radioisotopes will be in providing those of extremely short lives, and in the production of special materials not available through the Oak Ridge service. However, Oak Ridge is a most convenient source for most radioisotopes used today by medicine, agriculture and industry, and there is no intention for the Tech reactor to take over the work which is now being done so well by the AEC at Oak Ridge.

The most important uses of the Georgia Tech research reactor will be in experiments in which the radiation will be used directly. Neutrons will be brought out of the shield of the reactor in very tiny beams. These will be sent through an apparatus so that the nuclear properties of materials can be studied. For instance, in many cases, the arrangements of atoms and crystals can be studied better with an intense beam of neutrons than with X rays.

Also, the properties of many materials are altered in subtle ways while radiation is falling on them. For instance, the early development of the transistor—which made possible, among many other things, the pocket-sized radio—was considerably aided by studying the behavior of germanium, of which the transistor is made, while neutrons were falling on the germanium.

Other Important Uses

Another important use for the Georgia Tech reactor will be in connection with biological and medical studies. Facilities are being provided so that nuclear radiation can be used for diagnosis and for therapy. The use of neutron beams in cancer therapy is very new, but shows some promise. Only a nuclear reactor can give neutron beams of an intensity and of a kind suitable for such work.

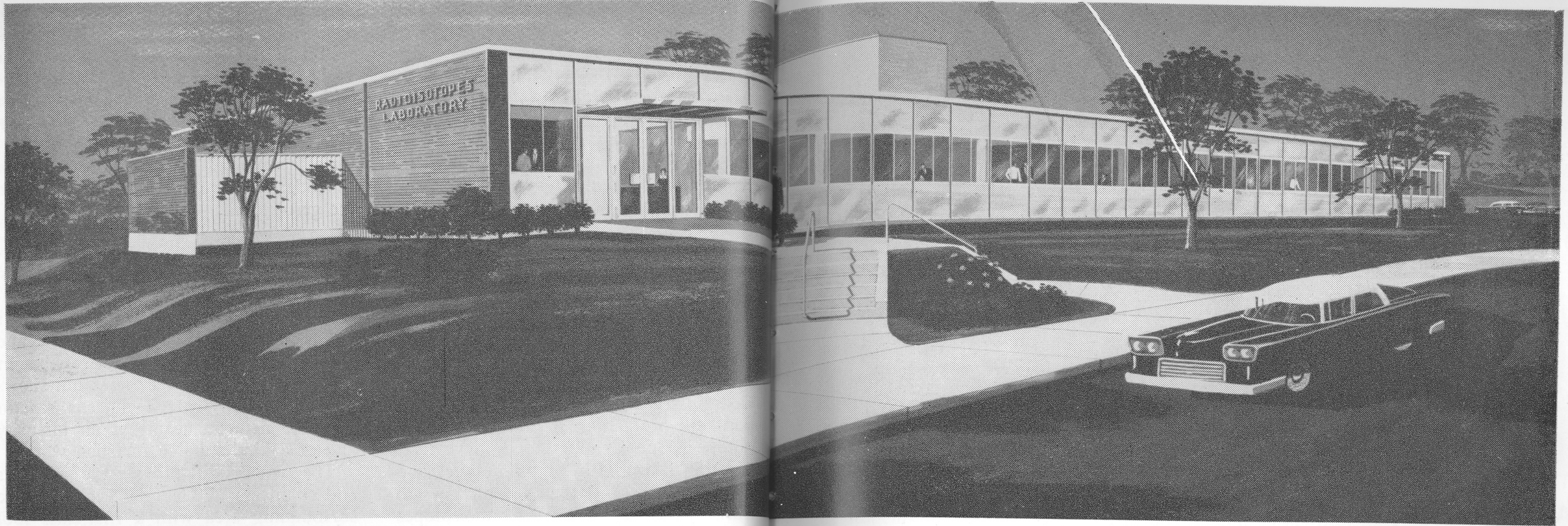
The reactor will provide the scientists and engineers of Georgia Tech and the surrounding area with a first-class tool for nuclear energy research.

The reactor itself does not guarantee that good research will be done. But its presence at Georgia Tech will hold in the school, and attract to it, those competent, highly technically trained people who are necessary if research is to prosper.

If I am not mistaken, this research reactor will be the first facility of its kind in the Southeast. Therefore, it will enable Georgia Tech to take its place alongside the Massachusetts Institute of Technology and the University of Michigan as a leader in nuclear energy development.

Our country has embarked on a large-scale use of nuclear energy for peaceful purposes. And we must continue to maintain our strength in the military uses of nuclear energy. Such a program requires large numbers of skillful people. It is the duty and the responsibility of our universities to graduate young people with this training.

The Georgia Tech research reactor will be a very important element in providing this training for the young people of our nation.



Sketch of Georgia Tech's New Radioisotope and Bioengineering Laboratory by Nat Browne.

John W. Cherry, Architect

RADIOISOTOPES REPORT

A grant from the National Institutes of Health and additional grants from the Regents make possible an improved facility

THE YEAR 1957 has been one of real accomplishment in Georgia Tech's Radioisotopes Laboratory program.

Early in 1957, when plans for the Radioisotopes Laboratory building were still in the preliminary stage, steps were taken to provide for expansion of the proposed structure to include a 6,000 square foot bioengineering section. Proposals were initiated in hope of obtaining grants of $125,000 from the National Institutes of Health and of $69,500 from the Board of Regents of the University System. Both grants were approved by the late summer of last year. Thus the size of the new building was increased by 60 percent before construction had begun.

The wisdom in the basic planning of the new structure by Dr. D. C. Bardwell of Vanderbilt University and the excellent and flexible design by the architect, John W. Cherry of Atlanta, provided an easy, economical expansion to the present size of the building. The working drawings are now complete for the laboratory and the added bioengineering wing. Construction on the new building—to be located at the corner of Sixth and Plum Streets in the Northwest section of the campus—will begin early this year.

The important positions in the Radioisotopes Laboratory staff have been filled and research programs in radiation chemistry, radiochemistry, and radioactive waste disposal are already underway. These programs will be considerably amplified when the much needed building becomes available in early 1959. Research in these three fields will occupy the major part of the laboratory's research space.

Major lecture and laboratory courses in Georgia Tech's nuclear graduate programs are being taught in temporary locations on the campus awaiting completion of the laboratory. Tech's subcritical assembly and other educational tools will be moved into the new building which will be used for teaching as well as research purposes.

Regional Cooperation

Discussions of ways in which the fully equipped radioisotopes laboratory may be used to the greatest advantage for the benefit of the region have been held with faculty and staff members of Emory University and with Dr. W. H. Cargill of the Veterans Administration Hospital in Atlanta.

Problems of disposal of radioactive waste from the laboratory have been discussed with representatives of the Georgia Health Department and the Sanitary Department of the city of Atlanta. A proposed disposal scheme designed by engineer J. W. Austin, Jr., of Atlanta, was discussed with these official representatives and modifications agreed upon by the group have been incorporated into the design.

Through the efforts of many people, the Radioisotopes Laboratory program at Georgia Tech is maturing as an expanding research and educational program, to offer maximum benefits to Georgia Tech, the community, the South and the Nation. The promise first written in these pages two years ago of a laboratory which will place Georgia Tech among the best equipped educational institution in the United States for nuclear science and engineering training and research is now all but realized.

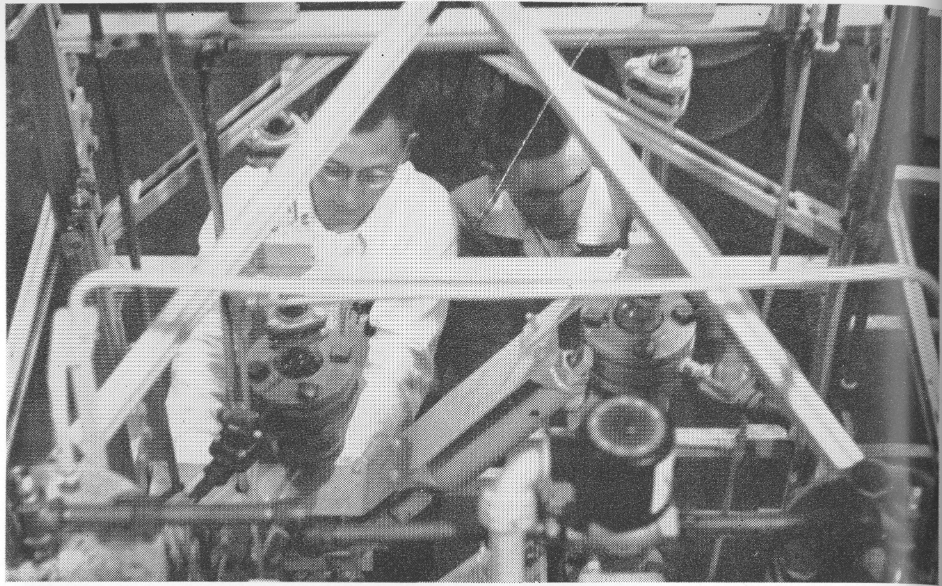


Photo by Bill Diehl, Jr.

A progress report

Georgia Tech's Nuclear Program

A BROAD PROGRAM of nuclear graduate education at the graduate level was launched at Georgia Tech in the fall of 1956. This program leads to a master's degree in either nuclear science or nuclear engineering, depending on the student's major field.

The candidate for a degree in this program begins graduate work in the school of his bachelor's degree, where he takes approximately half of his master's degree work (for example a candidate for the master's program with an undergraduate degree in mechanical engineering will take about one-half of his graduate work in mechanical engineering). The other half of his work will be in the nuclear core curriculum, see table 1, designed to give all the students in the program a thorough grounding in nuclear science and technology. All of the core courses except reactor technology and mathematics have associated laboratories three hours a week.

The course in nuclear physics and neutron and reactor physics have laboratories based on experiments performed with Georgia Tech's light-water-moderated subcritical assembly, currently housed on the campus in a temporary location, but intended for permanent housing in the new radioisotopes laboratory.

TABLE 1—GEORGIA TECH'S NUCLEAR CORE CURRICULUM

Title	*Course Number*	*Quarters*
Nuclear Physics	Physics 675	1
Neutron and Reactor Physics	Physics 676	1
Radiochemistry	Chemistry 460	1
Reactor Technology I and II	Mech. Engr. 601 and 602	2
Biological Effects of Radiation	Public Health 630	1
Mathematics	Mathematics 411, 412 and 413 or 401, 402 and 403	3

In addition to the core courses, there are courses in nuclear separations chemistry in the Chemical Engineering curriculum, in advanced radiochemistry in the Chemistry curriculum, in radioactive waste treatment and disposal in the Civil Engineering curriculum, in nuclear reactor theory in the Physics curriculum, etc. See table 2. In this way the various schools on the campus are able to provide students with a high attainment of specialized training based on a broad "core" of information. To complete the requirements for a degree, the student is encouraged to prepare a special problem or thesis dealing with an application of his major field to nuclear technology.

Nuclear graduate courses can be taken by students in the Schools of Aeronautical, Ceramic, Chemical, Civil, Electrical, or Mechanical Engineering, or in the Schools of Chemistry, Mathematics, or Physics. Upon completion of one of these programs, the student receives his master's degree in Nuclear Engineering or Nuclear Science, again depending on his major field.

Georgia Tech is planning to greatly augment its educational and research facilities in the field of nuclear science and engineering over the next several years. Existing graduate programs, particularly the doctorate programs, will be expanded continuously so that more nuclear courses will be added from time to time in almost all of the schools. The new research facilities will permit more thesis research involving problems in nuclear science and technology. This development will be accomplished chiefly through the acquisition of the research reactor and the associated irradiation and handling facilities, and by the employment of more scientists to conduct research and teach graduate courses.

It is believed that the Georgia Tech nuclear education program—designed to provide a student with the fundamentals and basic principles of this new technology—will contribute significantly toward satisfying the existing needs for scientists and engineers educated in nuclear science and technology and prepared to undertake fundamental and applied research in this field.

Title	*Course Number*	*Quarters*
Radiochemistry	Chemistry 657	1
Experimental Radiochemistry	Chemistry 658	1
Radiochemical Separations Processes I.	Ch. E. 630	1
Radiochemical Separations Processes II.	Ch. E. 631	1
Nuclear Processing Kinetics	Ch. E. 632	1
Engineering Materials in Nuclear Engineering	Ceramics E. 450	1
Removal of Radionuclides from Water	Civil Eng. 660	1
Disposal of Radioactive Wastes	Civil Eng. 661	1
Materials and Design for Radiation Shielding	Civil Eng. 662	1
Special Topics in Physical Chemistry —Radiation Chemistry	Chemistry 762	1
Nuclear Reactor Theory	Physics 680	1
Nuclear Physics	Physics 624	1
Theoretical Nuclear Physics	Physics 724	1

TABLE 2—SPECIAL COURSES OFFERED WITH TECH'S NUCLEAR PROGRAM.

The head of Tech's Reactor Project reports on some ways it can help you

NEUTRONS, GAMMA RAYS AND YOU

BY WILLIAM B. HARRISON, III

A RESEARCH REACTOR is a unique device for the production of neutrons and gamma rays in large quantities. The research possibilities for neutrons and gamma rays are practically unlimited. In order to illustrate these possibilities, a few examples will be cited in major fields of endeavor broadly identified as agriculture, medicine, industry, and education.

In agriculture, a large activity is developing about the subject of food preservation. It has been found that certain food stuffs may be preserved by exposure to gamma rays which come from a reactor, or radioisotopes made in a reactor. It would appear from the results on food preservation that there is no longer a need for refrigeration of chickens, seafoods, bacon, pork, beef liver and a number of vegetables such as asparagus, green beans, broccoli, Brussell sprouts, carrots and corn. Such developments will bring important changes in food handling, marketing and transportation. Imagine the impact this will have on the shrimp industry around Brunswick and the chicken industry around Gainesville.

Another fascinating aspect of the use of irradiation in agriculture is in bringing about favorable mutations. Though the idea of developing favorable mutations is not new, the use of the irradiations greatly accelerates such work. For example, a rust resistant strain of oats has recently been developed. It is estimated that the results obtained in 18 months on this rust resistant oats strain would otherwise have taken about 10 years by conventional methods. By the same irradiation technique, increases up to 30% in productivity of peanut plants have been produced, and, furthermore, peanuts so grown are in better shape for mechanical harvesting and are disease resistant.

Radioisotopes are now in use in studies involving effective utilization of fertilizers and trace elements in farm crops. Not only are they being used to find out how much fertilizer is most useful, but also in what forms it should be made and in what manner it should be dispersed. This should lead to economies in farm production. As a result of cooperative use of the Georgia Tech Research Reactor by the University of Georgia and the Agricultural Experiment Station, larger and better fruits and vegetables, freedom from ravages of many farm insects and diseases, increased farm productivity and more efficient farming methods are predicted for the future.

In medicine, pertinent work of the past has been primarily with the use of the radioisotopes which may be made in reactors. You are perhaps all familiar with the use of radioactive iodine in the treatment of an overactive thyroid. The iodine goes to the thyroid and there its radiation destroys some of the cells so as to reduce the production of thyroxine. Radioisotopes have also found application in diagnosis of such things as pernicious anemia, gastric ulcer, and the detection of brain and eye tumors. The reactor itself will be essential for medical studies in which neutrons are required. For example, neutron therapy is being investigated in the treatment of certain types of brain tumor. In the Georgia Tech Research Reactor, accommodations are provided for this type of treatment.

In order to insure that medical needs will be satisfied by the Georgia Tech Research Reactor, the conceptual design has been influenced by representatives of the Veterans Administration Hospital, St. Joseph's Infirmary, and Emory University in Atlanta, as well as the University of Georgia Medical College and the Talmadge Memorial Hospital in Augusta.

In industry, different uses are seen for the radioisotopes, the gamma rays, and the neutrons of the research reactor. Within the next 20 years, the electric power from nuclear sources is expected to equal our present installed generating capacity. The technology for this nuclear power industry is now under development, and there are many problems which must be resolved in the process of making nuclear power competitive with conventional power. The location of Georgia Tech with respect to Lockheed, Georgia Power Company and other outstanding companies involved in important nuclear power programs of national interest, suggests that the Georgia Tech Research Reactor may play a part in solving some of these problems.

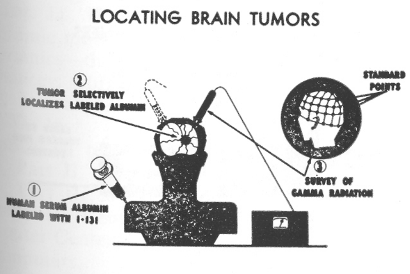
Other examples of the use of irradiation from reactors arise in a variety of industries. Some materials have greatly improved properties after irradiation. An example is irradiated polyethylene which is now a commercially available item. Radioisotopes are employed in thickness gages which have found application in the metal, paper, cigarette and plastic industries. Radiation is used in inducing or accelerating chemical processes and, hence, radioisotopes have found application in various chemical and petroleum industries. The Georgia Tech Research Reactor will play an important role in developing new materials, new methods, and, in fact, complete new industries.

In education, cooperative use of the Georgia Tech Research Reactor will provide instruction and facilities for the needs of schools throughout the South. However, the most obvious benefits to education will show themselves at Georgia Tech. In considering what the research reactor will do for Georgia Tech, the reactor becomes a symbol of the nuclear age. It will help establish Tech's role as the leading nuclear center in the South. It will have an important function in intergrating the educational and research programs at Georgia Tech. No other facility will bind together so many different conventional fields of endeavor as the research reactor.

The electrical engineers will be interested in reactor controls and radiation detection instruments. The mechanical engineers will be interested in the heat transfer, fluid mechanics and thermal stress problems arising in reactors. The physicists will be interested in pursuing

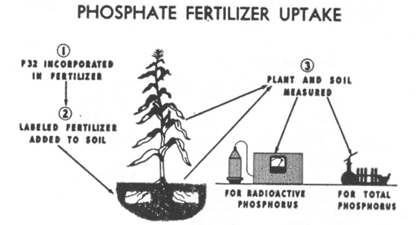
Continued on Page 16

A MEDICAL USE OF RADIOISOTOPES



Aid to diagnosis prior to surgery
Locates tumors not found by other means
Can use multiple counters fixed in standard positions

RADIOISOTOPES IN AGRICULTURE



SHOWS:
1—Fixation of phosphorus by soil
2—Phosphorus uptake by plant
3—Proper type and placement of fertilizer
4—Efficiency of fertilizer

studies of reactor theory as well as the basic studies of the structure of matter. The mathematicians will be solving complicated problems related to reactor design. The chemists will be using the reactor and its products in tracing complex chemical reactions and in developing new chemical compounds. The chemical engineers will be interested in reactor fuel and by-product processing. Ceramic engineers will be interested in development of new reactor fuel elements. Civil engineers will be involved in radioactive waste disposal and pertinent structural problems. Even architects must become acquainted with the handling of new shapes for reactor buildings of the future.

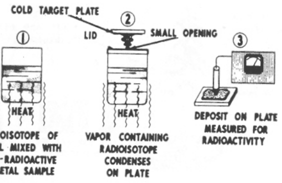
This reactor will bring to Tech and help to keep at Tech the scientific staff which is the essential element of an institution offering engineering and scientific education. The reactor will strengthen our graduate educational program by providing new possibilities for graduate research. The reactor will be supplemented by very important facilities now at Georgia Tech, such as the library (which has more than 25,000 documents pertaining to nuclear energy), the high speed digital computer center (in which the complex mathematical computations involved in reactor design may be carried out), and the other facilities of the Engineering Experiment Station, which has within its domain a large number of specialized laboratories and services. In addition, Tech's Radioisotopes Laboratory will be closely related to the reactor so as to give the maximum use from both facilities.

The conceptual design of the Georgia Tech Research Reactor has been influenced by the needs of the entire region. Provision has been made for the needs of agriculture, medicine, industry and education, including the needs that are seen on the Georgia Tech campus. The reactor will render a great service to the South and will be a facility of which residents of the State will be justly proud.

The State of Georgia has an unprecedented opportunity to become a leader in the research leading to applications of nuclear energy. The predictable future for applications of nuclear energy already is so large in scope as to stagger the imagination. Every field of scientific endeavor contributing to the present progress in the South will be expanded and improved by an active interaction with the fields of research related to nuclear energy. Every advance offers a broader base from which further advances can be made. In years to come, the State's investment in nuclear science and engineering, specifically in the research and education centered about Georgia Tech's modern research reactor facility, will pay large dividends to the State of Georgia and the South.

RADIOISOTOPES IN BASIC SCIENCE

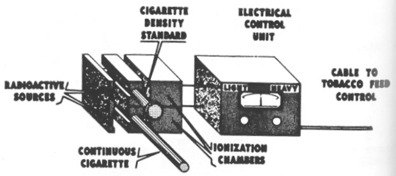
MEASURING VAPOR PRESSURE OF METALS



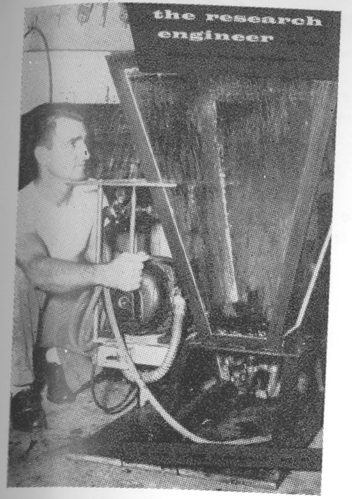
ADVANTAGES:
1—Method more accurate than chemical or physical methods
2—Experimental techniques not difficult or tedious

RADIOISOTOPES IN INDUSTRY

GAGING CIGARETTE FIRMNESS



ADVANTAGES:
1—More uniform firmness
2—Saves tobacco
3—Eliminates manual control



AN INDEX TO
THE RESEARCH ENGINEER
ISSUES OF 1955-1957
BY SUBJECT AND AUTHOR

Continued on page 18

Index to The Research Engineer, 1955-1957

Index to The Research Engineer, 1955-1957

Edited In Retrospect

Another year of Progress

• For the third consecutive year, the January issue of this magazine is devoted to a progress report on Georgia Tech's nuclear program. The overwhelming success of the first two issues on the subject (they were the most popular in the history of *The Research Engineer*) dictated this third progress report.

Georgia Tech's nuclear program has come a long way since January of 1956 when our first progress report was published. The master's level educational program in nuclear science and engineering is in full swing as you can see from the article on page 12. In the past two years several significant additions have been made to Tech's teaching and research staff in the nuclear fields making possible this expanded educational program. The subcritical assembly, which last year at this time was under construction, has been used as a laboratory tool in the educational program since last April.

The final plans for the radioisotopes and bioengineering building—expanded over 60% as a result of grants from the National Institutes of Health and the Board of Regents—have been completed. The building should be near completion by the time you get next year's progress report.

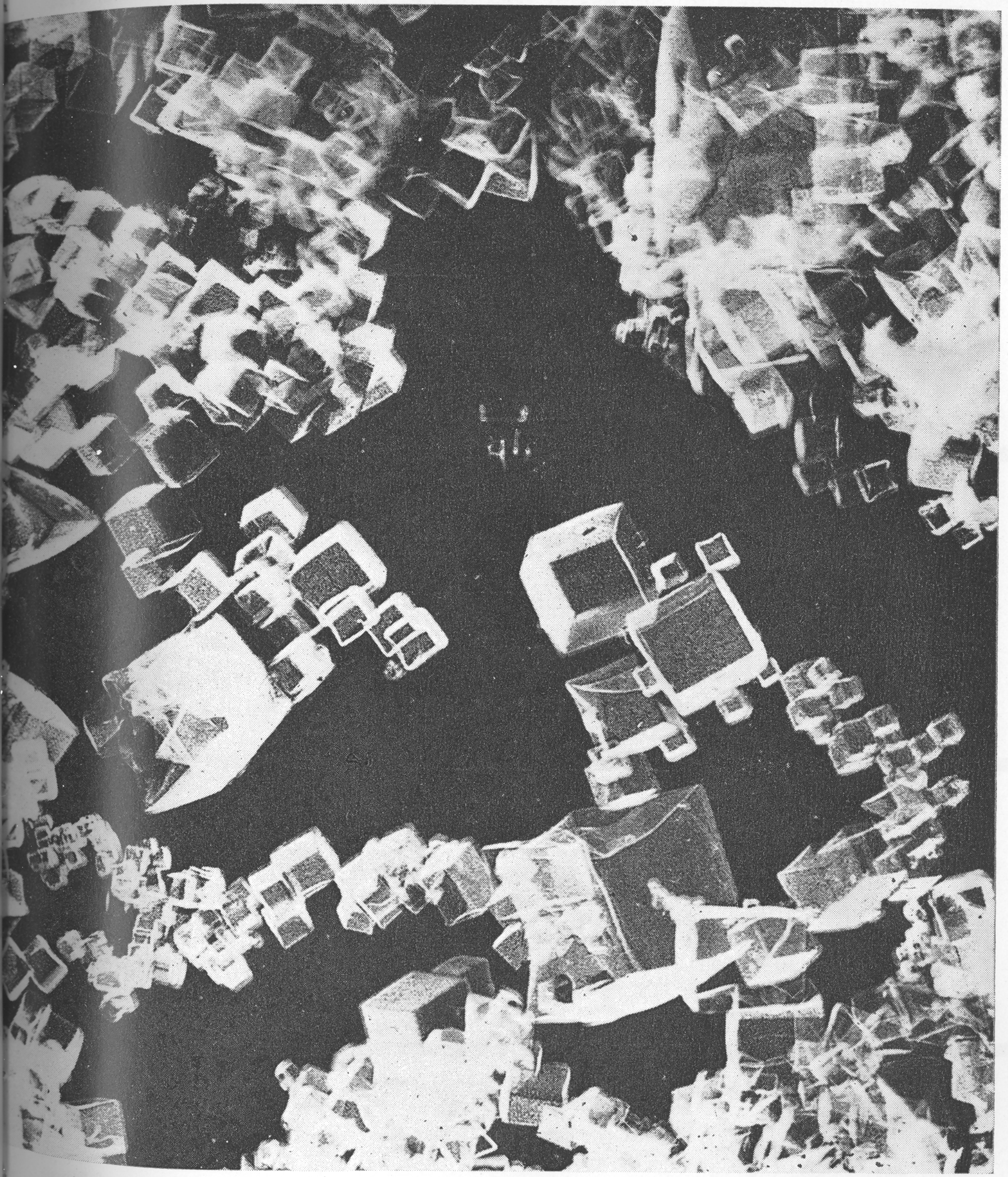
During the past year, Governor Marvin Griffin (see cover) turned over $2,500,000 in State surplus funds to the Board of Regents for the proposed research reactor. Proposals for aid from various federal agencies have been submitted by Tech to secure the $1,400,000 still needed for the construction of this heavy-water-moderated, enriched fuel, heterogeneous, tank-type reactor. The conceptual design of this reactor has been completed and the site selected. By the time the 1960 progress report is published, one of the finest nuclear research tools connected with any institution of higher learning should be well on its way to completion.

Its been a great twelve months for Georgia Tech and its nuclear program. We hope that we will have as much progress to report in next January's issue.

APRIL, 1958

The Research Engineer

Published by the Georgia Tech Engineering Experiment Station



A TECH MICROGRAPH
FOR A GT ENGRAVING
see page 2

Class Size & Learning - see page 11