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U.S. NUCLEAR REGULATORY COMMISSION

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THE ATOMIC AGE BEGINS

By Frank Malone,
Office of Resource Management

In November 1940, the National Defense Research Committee gave Columbia University a \$40,000 contract, directing that University scientists—including Enrico Fermi, Leo Szilard, John Dunning, Harold Urey, Eugene Booth, Walter Zinn, and George Pegram—conduct studies and experimental investigations in connection with certain properties of uranium and other substances....”

When the contract was signed, war had spread over most of Europe, and the United States, alarmed by the Nazi menace and the threatening posture of Japan, had begun to look to its defenses. But few men besides a handful of key scientists realized then that nuclear research might have powerful military implications.

For American scientists these implications had begun to crystallize in January 1939, when Niels Bohr arrived in this country from Denmark and told a few colleagues that he was about to announce that experiments in Europe proved that the uranium nucleus had been split.

On the evening of January 25, 1939, Professors Dunning and Booth, with Dr. Francis Slack, a visiting professor from Vanderbilt, went to the basement of Columbia's Pupin Hall. It was about 7 p.m. when they began setting up their apparatus. By 11 p.m., they had become the first Americans to confirm nuclear fission, and the first to measure the release of "atomic" energy. Some 5 weeks later, on March 3, Professors Szilard and Zinn performed another historic experiment, this time on the seventh floor of Pupin Hall, which emphasized the possibility of the now famous "chain reaction."

On March 16, Dr. Pegram wrote to Admiral S.C. Hooper at the Office

of the Chief of Naval Operations. He began: "Experiments...at Columbia...reveal that conditions may be found under which uranium may be able to liberate its large excess of atomic energy, and...that uranium might be used as an explosive that would liberate a million times as much energy per pound as any known explosive."

Dr. Pegram's letter failed to stir any activity in Washington. So, on August 2, 1939, after being persuaded by Professor Szilard and several other scientists, Albert Einstein agreed to sign a letter to President Roosevelt. The note, which urged further atomic research, opened: "Some recent work by E. Fermi and L. Szilard...leads me to expect that the element uranium may be turned into a new and important source of energy in the immediate future. Certain aspects of the situation which have risen seem to call for watchfulness and, if necessary, quick action on the part of the administration."

By February 1940, the Army and Navy were sufficiently interested to issue Dr. Pegram a \$6000 grant to aid researchers at Columbia. The pace quickened, and by November the government was ready to award its first contract for atomic research to Columbia. The experiments, under the full and direct charge of Dr. Pegram, were to be conducted in the utmost secrecy.

Using the \$6000 grant, Professor Fermi and his colleagues began building a small nuclear reactor. It was nothing more than a small pile of graphite. Fermi knew he could not produce the desired chain reaction with such a pile, but he could collect important information. He collected his data, and the wall grew — up to the ceiling, in fact — but not high enough to produce the reaction.



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In October 1941, about the same time the Government decided to build an atomic bomb, Professors Pegram and Urey were sent to England to discuss atomic energy with British scientists. When they returned, their reports made it clear that the U.S. would have to assume the chief responsibility for outdistancing the Axis Powers in the perfection of atomic power. The U.S. government decided that the Columbia scientists should greatly enlarge their efforts on the diffusion method of separation of uranium-235. (This method proposed by Professor Dunning and his group was and still remains the starting point for the vast nuclear-energy complex our government has built.) At the same time every effort was made to attain the chain reaction in a uranium-graphite pile.

By November, however, it was obvious to Fermi that he and his associates could not conclude their experiments in their limited quarters. They looked for more space on the Columbia campus, and, when none was available, they searched elsewhere in the New York metropolitan area.

On December 6, 1941, Vannevar Bush, the Chairman of the National Defense Research Committee, who had signed the contract with Columbia 13 months earlier, announced that the Government would expand its atomic research program. He also announced that

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Compton in Charge (Continued from page 4)

Professor Arthur Compton of the University of Chicago would be in charge of the basic studies of the chain reaction.

The next day the Japanese bombed Pear Harbor.

Compton soon decided that all the work under his command should be moved to Chicago, and, by October 15, 1942, a new atomic pile was under construction on the squash court at Stagg Field.

On the morning of December 2, with Professor Fermi in charge, the researchers were ready to attempt to achieve a chain reaction. The final cadmium control rod was ready to be removed from 13 feet within the pile. Fermi had calculated that the removal of the rod would cause the chain reaction.

The rod was pulled out, slowly and steadily, as radiation was measured. About 3:20 p.m. Fermi was sure that one more pull would start the reaction.

The rod was removed. The needles on the counter dials swerved upward. The world's first chain reaction had occurred. At 3:52 p.m. on December 2, 1942, man had initiated a self-sustaining nuclear reaction—and then stopped it. He had released the energy of the atom's nucleus and controlled that energy.

After silently toasting each other, the scientists filed out from the former squash court. One of the guards asked: "Something happen in there?"

The guard had not heard the message Professor Compton gave James Conant at Harvard by long-distance telephone. The message had not been prearranged, but it went: "The Italian navigator has landed in the new world."

"How were the natives?" asked Conant.

"Very friendly." was the reply.

Problems "Various"

As to the problems confronting the NRC today, Commissioner Roberts called them "various and complex." He said the NRC must have a system of regulation that will ensure that the public health and safety are protected through accurate analysis, critical oversight, and strict but fair enforcement of its rules, practices, and procedures. In addition, he said, the NRC must continue to be committed to the safe operation of nuclear power plants so that the country can enjoy all its energy and the public be assured that their health and safety are protected. Moreover, he said, "we must have safe disposal of high-level waste so that our legacy to our children is something of which we can be proud. We must foster a recognition of the importance and effects of our export/import actions."

In closing, Commissioner Roberts told the Senators, "We...must be

Credit Union Offers New, Longer Hours

The Energy Federal Credit Union (EFCU) offices are now open longer hours.

Offices in Bethesda and Germantown, as well as in the Forrestal Building, are open Monday through Friday from 8:30 a.m. to 3 p.m. The Shady Grove office is open Monday through Friday from 8:30 a.m. to 6 p.m. and Saturday from 9:30 a.m. to 12 noon.

All offices will be closed Monday, September 2, for the Labor Day holiday.

Editor's Note: Frank Malone has worked for the U.S. government in the nuclear field for more than 40 years. As space permits, in future issues, we hope to publish more of his insights into the early atomic era.

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able and ever-willing to make the hard decisions that are needed to protect the public health and safety. I pledge to you that I will."

Commissioner Roberts was graduated from Georgia Institute of Technology in 1959 and served as an officer in the U.S. Navy from 1959-1962. He joined Southern Boiler and Tank Works, Inc. in 1962 and served as its President and Chief Executive Officer from 1969 to 1978. He was an underwriting member of Lloyd's of London and a Director of Boyle Investment Company in Memphis, Tennessee.

Commissioner Roberts and his wife reside in Chevy Chase. They have three daughters.

Nuc Lines

The NRC Employee Recreation Association is offering members discount tickets to area attractions.

Tickets for a family theme park in Lanham, Maryland, are available from Corie Paul (extension 28026) for \$6.00. Discount movie theater tickets are available from Debby Johnson (extension 27507) for \$3.

The 1985 Recreation Association Board of Directors includes:

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