

Some Incidents in Research

In the big brick Chemistry Building on the Iowa State campus F. H. Spedding was pursuing his regular duties in teaching and research on December 6, 1941. For years he had been interested in a strange family of chemical elements known as "the rare earths." Actually, they were not earths at all — but metals.

The telephone rang, and Dr. Arthur H. Compton, at the other end of the wire, urgently requested the Iowa State College professor to come to Chicago on a matter of the utmost importance to national security. By the time Spedding reached that city, the bombs at Pearl Harbor already had plunged the nation into World War II, and he was briefed on the highly secret Manhattan Project which eventually led to the production of the atomic bomb.

Compton had reached for Spedding because he knew the Iowa State College scientist, in his rare earths research, had knowledge that would be invaluable in obtaining pure uranium, thorium and plutonium, materials without which it would be impossible to reach the goals set for the project.

At first it was thought that Spedding would spend most of his time at the University of Chi-

cago, but he soon moved major operations to the Iowa State College Chemistry Building and to a decrepit structure known as Annex No. 1. Inside its patchwork of wooden-framed rooms was kept one of the deepest military secrets of the war, and from it flowed much of the pure uranium metal which Compton and his colleagues required.

At the start of the war metallic uranium metal was a laboratory curiosity, costing about a thousand dollars a pound. New methods developed under Spedding's direction drastically reduced the cost of casting ingots of the pure metal. Two new processes of making uranium metal were so promising that the College was awarded a substantial sum to carry them through the pilot stage and to produce some tons of metal to start the nuclear reactor which was being built beneath the University of Chicago athletic stands.

Under the supervision of Spedding and Dr. Harley Wilhelm, thousands of dollars worth of expensive equipment was installed. The working force consisted of some ten undergraduate chemistry students and chemical engineering students at Iowa State, who served as foremen, plus about ninety other workers recruited from the Ames area. They were barbers, bricklayers, carpenters, salesmen, florists — but none knew where their secret job fitted into the total war plan of the Allies.

Residents of Ames dubbed Annex No. 1 "Little

Ankeny" in reference to the Ankeny Ordnance Plant which was operating full tilt south of Ames. Some thought "Little Ankeny" was manufacturing a new type of poison gas or a new kind of hard metal for tanks. A few suspected the whole operation was just another government boondoggle. That idea received additional emphasis when it was noted that the product of "Little Ankeny" was shipped out in express cars that seemed practically empty. No one bothered to tell these people that the product was uranium, which is so heavy that a covering of a few inches over the floor of the car was a maximum load! Meanwhile, "Little Ankeny" met its quota of uranium production each month, and each month that quota was promptly doubled. Dr. Spedding says:

I certainly don't recommend our way of doing things in those days as the proper way to carry on research, development or production. But there was a tremendous urgency, and we resorted to any method to get the job done.

One of the big hazards was molten metal breaking out of the furnaces in which it was being heated. It was a spectacular sight to see it leaping across the floor, and since the nearest place of safety was the washroom it was customary to dive in there, then observe through a crack in the door.

Fires were almost an everyday occurrence — sometimes there were as many as six per day — but the Ames fire department was not cleared to enter the building so the working force was al-

ways ready with buckets of lime and graphite to smother any flames that broke out. Explosions were not uncommon; one blew a wall out about eighteen inches.

In spite of the urgency which dominated those early days, "Little Ankeny" failed to record a serious accident, and the crew kept hard at work in crowded conditions, smoke, and flame, without the benefit of the fans and ventilators which were unobtainable. Midway in the war the need for uranium became so acute that a salvage operation was undertaken in the College dump where refuse from "Little Ankeny" had been taken. Even dirt outside the door of the building was dug up and shipped to Chicago for reclamation of the uranium.

As other plants came into operation in 1944, the production of uranium was cut back, then shifted to thorium until the end of the war. But "Little Ankeny" had produced more than two million pounds of uranium at a time when every pound was of the utmost importance, and processes developed by the Iowa State College group had saved hundreds of millions of dollars by bringing the processing cost of the metal down to about thirty cents per pound. "Little Ankeny" itself, possibly the most historic building on the campus, came under the wrecker's hammer in 1953.

In its place, the Atomic Energy Commission, following the war, leased campus land to erect

approximately six million dollars worth of new laboratories. A special administrative division of the College, The Institute for Atomic Research, operates the Ames Laboratory of the United States Atomic Energy Commission whose 550 employees occupy the new buildings. Spedding is director of the Institute, and some of his wartime team of scientists are still with him delving into basic problems in the field of nuclear research, mainly directed at the peacetime uses of the atom.

Spectacular results of this nature are not the rule at Iowa State, but almost from the day the College Farm was first put in order much time has been spent in seeking new facts and new knowledge for the benefit of the state and of the nation. This is a part of the Land-Grant idea.

I. P. Roberts, first superintendent of the College Farm, made tests of cereals, feeds, and fertilizers. J. L. Budd made a special trip to Russia in 1882 in an attempt to find trees and shrubs useful to Iowa. Other faculty men were equally diligent in botany, entomology, horticulture and animal husbandry. In 1879 the College claimed the first experimental creamery. Results were published regularly in College reports and periodicals and in bulletins of the United States Department of Agriculture.

Seaman Knapp, especially, was interested in research and its development. In 1882 he and C. E. Bessey drafted a bill for federal endowment

of experiment stations, and though it was lost in committee in Congress, Knapp continued to agitate for the idea until the Hatch Act of 1887 granted the federal aid. On March 2, 1888, the General Assembly passed the act which established the Iowa Agricultural Experiment Station. Farmers became accustomed to saying — "Down at the College they say . . ." or "At Ames they're recommending . . ." when they talked about ways and means of farming.

John Evvard is credited with one of the first major research contributions to the livestock industry of the state. Coming to Iowa State in 1910 after graduation from the University of Illinois, he not only made important discoveries but he had the capacity for explaining them to farmers. Thousands gathered for the feeders' days Evvard held on the flats west of Squaw Creek and near the campus. The biggest single advance in the history of livestock feeding may have resulted from his advocacy of the self-feeder. He exploded the idea that some of the early commercial feeds had any magical qualities, and started the feed industry into the immensely profitable development of research-proven feeds.

Important as were some of these early investigations, they dwindle when compared to the advances of the last twenty years. When hybrid corn increased yields thirty per cent in the 1930's, Iowa State began work on inbred lines which are

now used almost exclusively in Iowa hybrids. Oat breeders at Iowa State developed one new variety after another to keep ahead of new disease threats, to boost yields, and to produce stiffer straw. Soybeans became a major crop before the 1940's, and most Iowa farmers plant varieties developed and proved at Iowa State.

Ten years ago five tons of feed produced about 1,050 pounds of beef, live weight, under good feeding conditions. Then came stilbestrol, an Iowa State discovery, which added one hundred pounds to the increase. Back in 1915 it took 512 pounds of feed to put one hundred pounds of gain on a hog. It takes three hundred pounds of feed to do the same thing today. The hogs grow faster ($1\frac{1}{2}$ pounds daily gain compared with 1 pound in 1915) and the litters are larger and the death loss smaller, too. This abundance, in which Iowa State researchers had a major hand, has proved almost embarrassing at times. Within recent years there has been less emphasis on production, and more emphasis on quality and efficiency.

In 1957 the College announced the formation of a Center for Agricultural Adjustment. In addition to sociological and economic adjustment problems, it is investigating marketing, processing, and consumption of farm products.

In 1944 Iowa State College led the way in incorporating home economics research into the Agricultural Experiment Station.

Some years ago researchers found the results obtained in Ames were not always valid in other parts of the state where soil and even climate were different. With the help of farmers and businessmen, a system of outlying experimental farms was established. Local people bought the farms, on which taxes are paid, and leased them to the College for research purposes. The bulk of the research still goes on at Ames, however, and at nearby Ankeny where 1,623 acres from the Ordnance Plant were turned over to Iowa State at the close of World War II.

It was vigorous Dean Anson Marston who prodded the General Assembly into establishing the Iowa Engineering Experiment Station in 1904 — an act which enabled the state to share with Illinois the distinction of putting its engineering investigations on an organized basis — research into sewage disposal systems, water supply systems, drainage systems, conduits, and highway materials and construction. With support from the Iowa Highway Commission, the highway projects have remained numerous and important. In addition, the Experiment Station has looked into utilization of agricultural by-products, manufacture of fertilizers, extraction of vegetable oils, soil mechanics, analysis of structures, analysis of problems of electrical transmission, and creativeness in machine design among other projects.

In 1913 a cholera epidemic was sweeping over

the nation; Iowa that year lost nearly 25 per cent of its hogs worth \$30,000,000. Iowa State's Division of Veterinary Medicine was asked to help combat the scourge. It was hoped that a veterinary research organization might be started to give courses to veterinarians in connection with anti-hog cholera serum. The General Assembly appropriated \$10,000 for research, \$5,000 for practitioners' courses, and \$35,000 for a State Bacteriological Laboratory. The laboratory produced and distributed the necessary serum, special veterinarians were put into the field, and the work of the College was credited with abating the epidemic. The Research Department was organized from the \$10,000 voted for this purpose during the emergency.

In 1920 a farm was acquired for research and for the manufacture of serum, and this proved to be the forerunner of today's Veterinary Medical Research Institute, the main laboratory and barns of which were completed in 1927. Because the basic sciences underlie almost all work at Iowa State College, research in these areas took on added impetus in the Twentieth Century. One of the big problems was to convince those from whom the necessary funds were sought that such investigations did not necessarily have to pay off in immediate results. Investigators pleaded for more time and more money to make the fundamental investigations necessary to keep replenish-

ing the pool of basic knowledge from which new scientific advances are made.

An increasing dependence upon mathematics for the solution of problems in science led Iowa State to develop new mathematical and statistical methods. More than twenty-five years ago it pioneered in applied mathematics by introducing punched-card techniques into computing methods used in its activities. In 1933 a Statistical Laboratory was established under the direction of George W. Snedecor as an independent research institute to promote and foster the appropriate and efficient use of statistical methods and theory in research at the College, and to provide fundamental scientific facts and principles which underlie the development and successful solution of agricultural and industrial problems in Iowa. Members of the laboratory received assignments in foreign lands, as well as on federal and military contracts. In 1956 the College began developing a high speed computing center to extend the scope and usefulness of its scientific research in all areas through use of modern high speed computers.

NED DISQUE