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today's scientists

Dr. Paul C. Aebersold—Mister Radioisotope

Atomic Energy Commission photo

Ex-track star Aebersold is now a star "salesman." "Product": radioisotopes.

ONE DAY in 1932, a husky young athlete in a Stanford track sweater trotted up to the physics building at the University of California in Berkeley. He strode into one of the laboratories, looked around for a minute, then approached a blond young man. The latter was bending over a square metal box with rods and wires sticking out of it.

"Do you know where I can find Professor Ernest O. Lawrence?" asked the Stanford runner, whose name was Paul Aebersold. "I'm a physics student, and I want to ask him some questions about his invention. I think he calls it a *cyclotron.*"

"I'm Professor Lawrence," said the youthful scientist. "And if you want to see the cyclotron, this is the main part right here. I'm trying to plug up a leak in the vacuum chamber."

A few minutes later, Paul Aebersold found himself at work, helping to repair the leak. This was his introduction to the eight-inch cyclotron—one of the earliest atom smashers. An atom smasher is a machine that accelerates electrically charged particles to a fantastically high speed. They are then fired at various target materials (*see "'Cannon' for Electrons," May 2, 1962 issue*).

Paul Aebersold had expected to spend about ten minutes in the lab. But the meeting with the inventor of the cyclotron steered him into a career in nuclear physics. Paul Aebersold stayed at Berkeley for ten years—first as a graduate student, then as a teacher and research scientist. He helped to build the 27-inch, 60-inch, and 184-inch cyclotrons.

Mission: To Educate Public

With these powerful atom smashers, physicists began to explore the structure of the atom—by bombarding the atoms in various target materials. This bombardment sometimes made the target materials radioactive. The atoms of a radioactive substance are *unstable*, and break down. When an atom breaks down, or "decays," it gives off radiation of high energy.

Some of the target materials contained *isotopes*. These are atoms of an element which are like other atoms of the same element in everything but weight. (The word *isotope* comes from two Greek words—*iso* meaning "same" and *topos* meaning "place.") Some isotopes are radioactive—others are not. A radioactive isotope is called a *radioisotope* for short.

Scientists have identified about 73 radioisotopes which occur in nature. Dr. Aebersold was a member of the scientific team that created some of the first *man-made* radioisotopes. This was done

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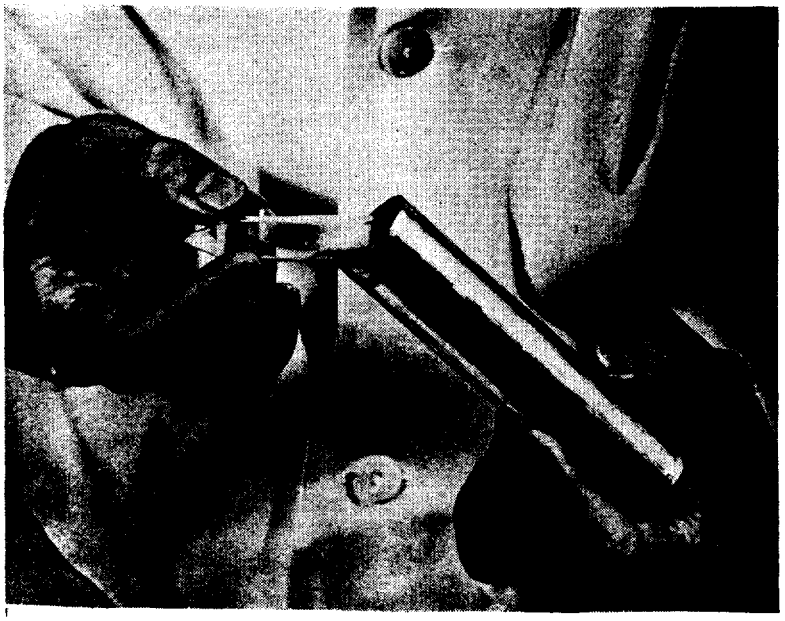
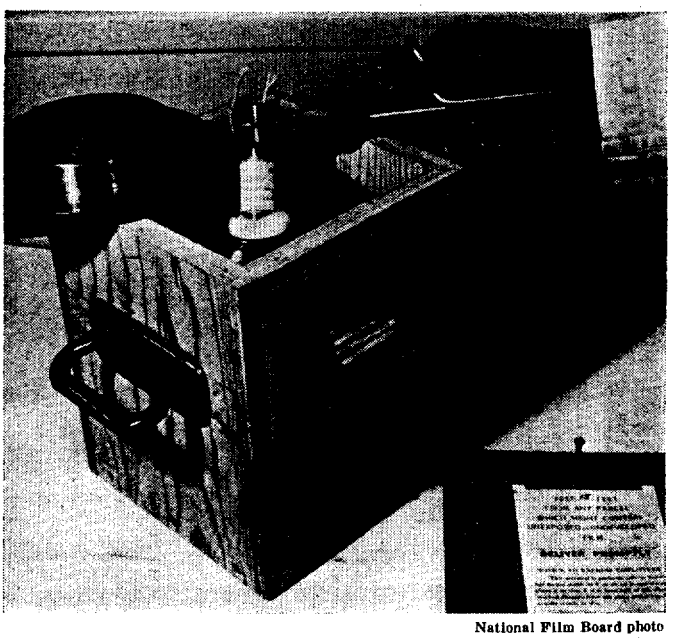


Atomic Energy Commission photo

Before being irradiated in nuclear reactor, sample to be made radioactive is inserted into aluminum capsule like this one. Isotopes have many uses in medicine, industry, and research.



National Film Board photo

Radioactive isotope of phosphorus made in Canadian nuclear reactor is being placed into heavy metal container for shipment to scientific researchers. Note the precautions that must be taken.

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by bombarding certain substances in an atom smasher.

Today, Dr. Aebersold is known as "Mr. Radioisotope." Every year, he travels some 50,000 miles, telling people about the peacetime uses of radioisotopes—from cancer research to food preservation, from insect killers to packaging gauges.

For Dr. Aebersold is director of the Division of Isotopes Development of the Atomic Energy Commission. He is the commission's chief "salesman," encouraging the use of radioisotopes in hospitals, industries, agricultural experimental stations, research laboratories, and colleges and universities.

Today, most radioisotopes are created in nuclear reactors—rather than in atom smashers. The atom smasher can create more types of radioisotopes. But a reactor can produce *larger quantities* of most of the radioisotopes that are useful. And the reactor can do the job at much lower cost.

Radioactive "Tags"

Scientists have created about 960 artificial radioisotopes. What can man-made radioisotopes do that nothing else can?

Enough books and pamphlets have been written on the subject to fill a library. The list of Dr. Aebersold's own works on isotopes fills five closely typewritten pages. Radioisotopes can be put to work in thousands of ways. For example, they can be used to "tag" various substances. Here is one example, in Dr. Aebersold's words:

"Let us assume that we want to find out how rapidly sodium travels through the body, and at what rate it is taken into various body fluids and tissues. All we have to do is to take some table salt—a sodium compound—and irradiate it in the reactor at Oak Ridge, Tenn. This gives us radioactive sodium.

"We can give some of this radioactive sodium to a person by mouth or by vein, and then follow its path through the body with a Geiger counter or some other radiation instrument. Radioactive sodium gives off *gamma rays*, which are similar to X rays.

"The gamma rays from radioactive sodium are so penetrating that we can detect them just by holding a counter over various areas of the body. This simple procedure allows us to 'see' when blood carrying the radioactive sodium reaches a certain part of the body. In fact, this technique is used for determining the adequacy of blood circulation to the arms and legs."

Using experiments such as this, doctors have learned that, in about 15 seconds, a dose of radioactive sodium will travel from one arm through the heart, through the lungs and into the other arm. Sixty seconds later, the sodium will be excreted from the sweat glands.

Radioisotopes also can be used to sterilize drugs and medical equipment. A British company seals plastic hypodermic syringes in an airtight package, and then bombards the package with gamma rays from a radioisotope. The rays kill any living organisms inside the package. Drugs also can be sealed in containers and sterilized in this way. And, the U. S. Army Quartermaster Corps is experimenting with ways to preserve food by irradiating it.

Automatic Weather Stations

Radioisotopes also are being used in automatic weather stations. As a radioisotope "decays," it gives off a tiny amount of heat energy. This heat energy can be converted into electricity by a device called a *thermocouple*. The electricity can then be used to run scientific instruments. Last year, an automatic weather station began to transmit data at a site a few hundred miles from the North Pole.

Last June, a radioisotope power unit was orbited inside a Transit satellite. This 4.7-pound power unit is called SNAP—short for *Systems for Nuclear Auxiliary Power*. In the years to come, SNAP units will provide power for many U. S. spacecraft.

How did Dr. Aebersold become interested in a career in science? "I guess it was science fiction that first got me interested in physics," he recalls. "I used to like H. G. Wells and Jules Verne. Then, I started reading any science magazines I could find."

When he was 12, young Paul came across an article that told him how to build a crystal radio set. He could hardly wait to assemble all the parts. "I used my own money," he recalls, "so it took a good deal of saving and planning."

"I'll never forget the thrill of hearing voices and music on my radio—and thinking of this miraculous transmission through space. I relived this thrill a few years ago when my 18-year-old son, Paul, built his own radio—but his was built with transistors."

Avenue to New Knowledge

By the time he reached college, Paul Aebersold's mind was made up. He was going to be a physicist. As a physics student at Stanford, he maintained an A average, made Phi Betta Kappa in his junior year, and received his B.A. degree, cum laude, in 1932. But it was not his academic record that led him to Berkeley, where he joined the pioneer team of atom smashers. Paul Aebersold was a track star, too.

That year, 1932, the Olympic tryouts were being held at Berkeley. Paul went up from Stanford for the tryouts, and decided to take some summer courses at the university. That's how he happened to call on Professor Ernest Lawrence—and begin his career in nuclear physics.

Dr. Aebersold feels that his main mission is to educate the public about what radioisotopes can do. Some are valuable sources of power. These include uranium-235, which is used as "fuel" in nuclear reactors. But Dr. Aebersold points out that "radioisotopes in general are far more valuable through their power to gain new knowledge."

—Barbara Land

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