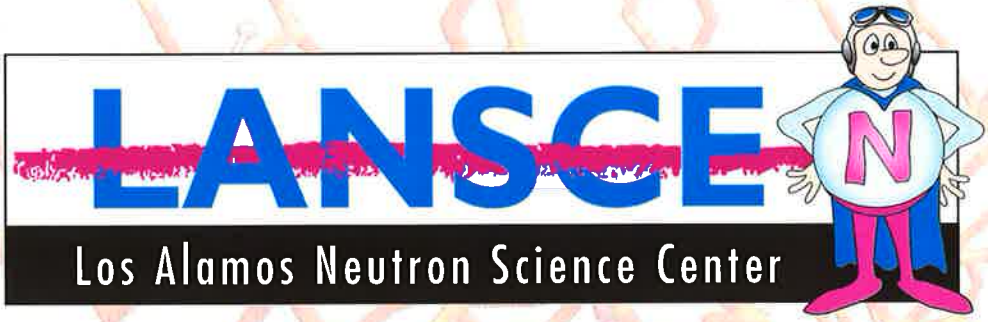

Coloring Book

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Welcome to the Los Alamos Neutron Science Center, nicknamed LANSCE!

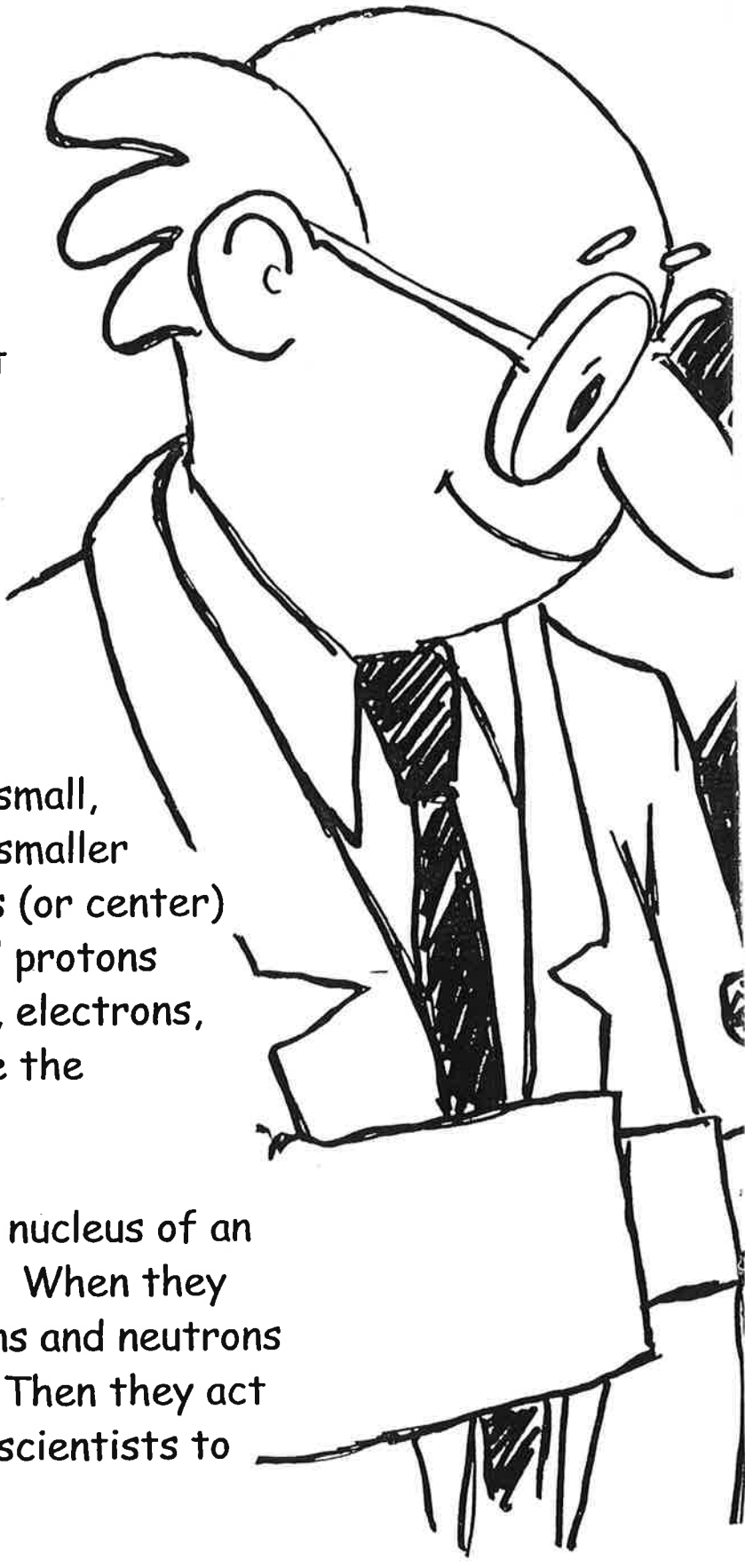

Science at LANSCE

What kinds of research do scientists perform at LANSCE?

LANSCE produces protons and neutrons so that scientists and college students studying physics, chemistry, and biology all over the world can perform experiments here.

What are protons and neutrons, and why are they important?

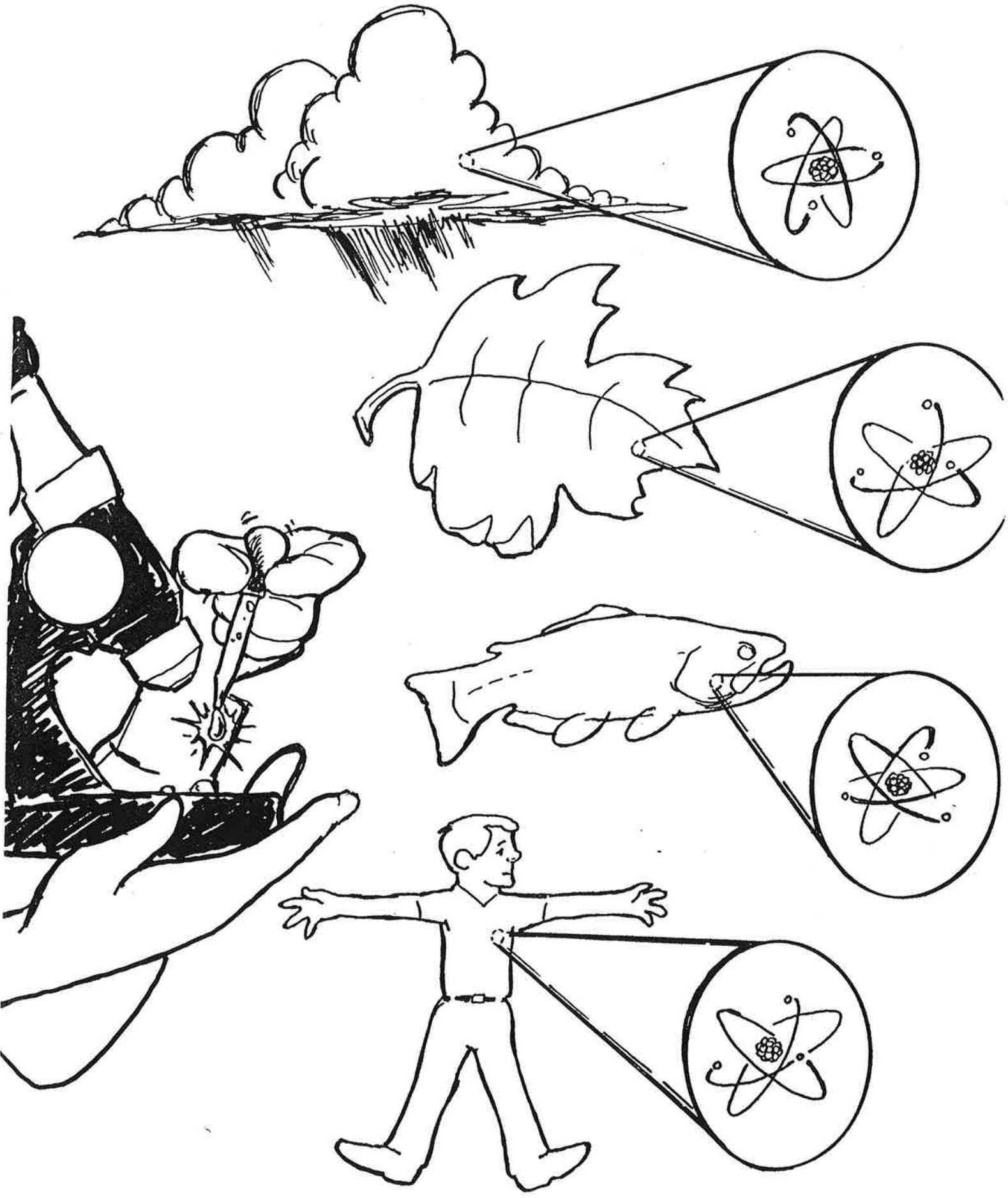
Before we can understand protons and neutrons, we first need to talk about atoms. Everything in the world is made up of atoms: the air you breathe, the grass and trees outside, even your body is made up of atoms.



Atoms are very small, so small that you can't see them without the help of an extremely powerful magnifying glass. In fact, atoms are so tiny that there are 100,000,000,000,000,000,000 atoms in a single drop of water!

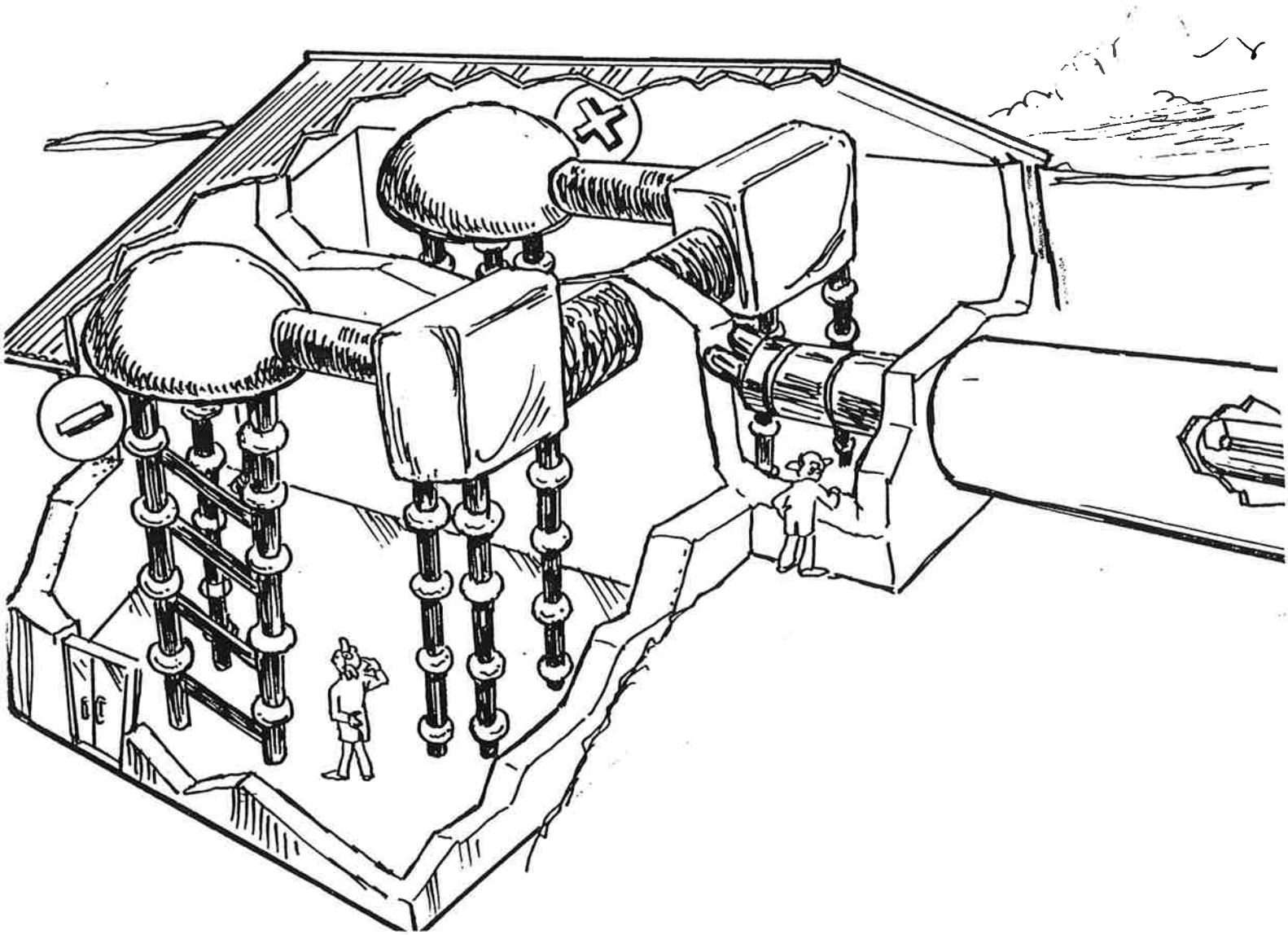
Even though atoms are extremely small, they are actually made up of even smaller particles. Every atom has a nucleus (or center) made up of smaller particles called protons and neutrons. Other tiny particles, electrons, orbit around the nucleus, much like the planets travel around the sun.

These protons and neutrons in the nucleus of an atom are very useful to scientists. When they are set free of the nucleus, protons and neutrons can easily go inside other matter. Then they act like a magnifying glass by allowing scientists to "see" inside solids and liquids.

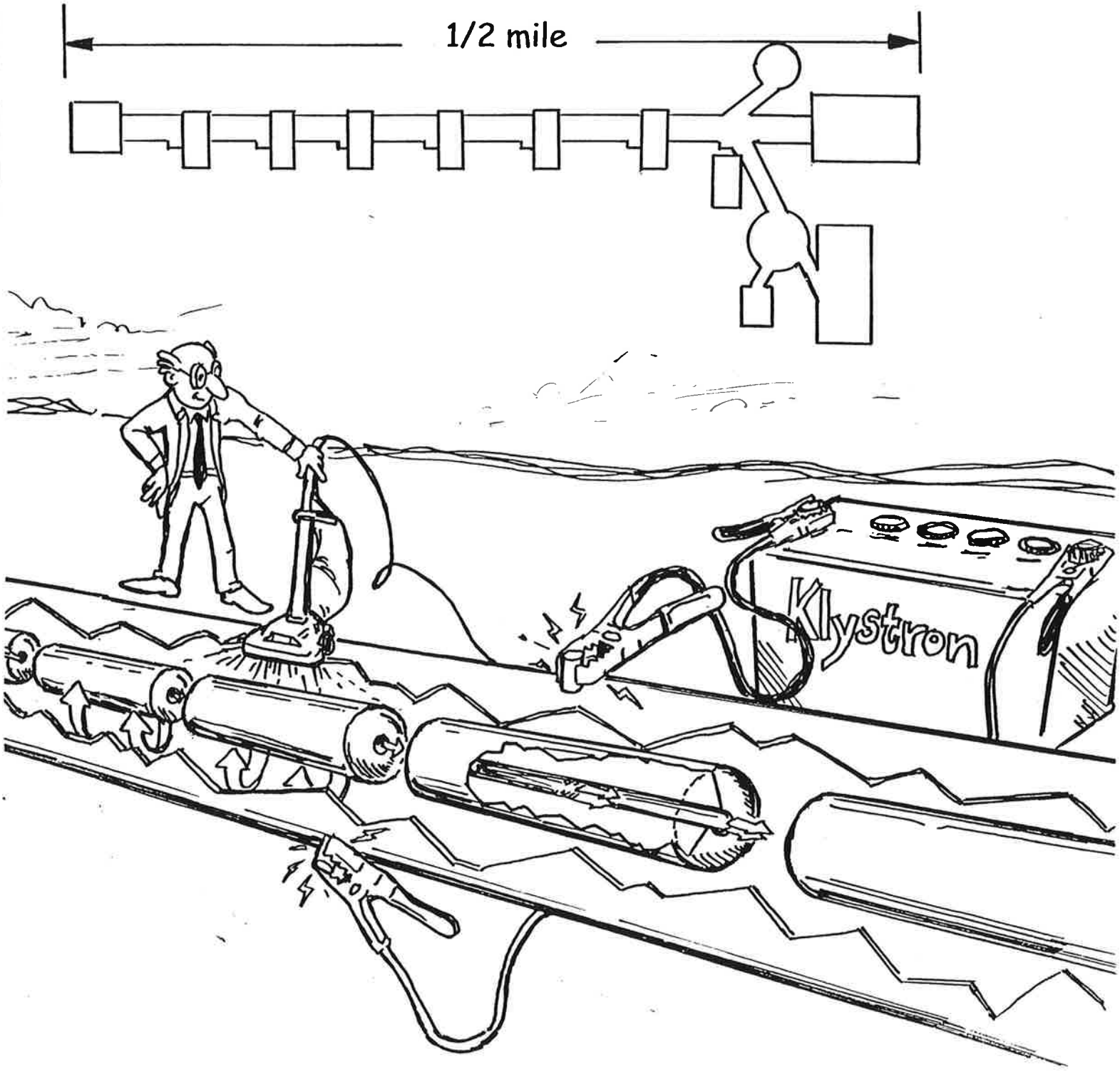


How can scientists get the protons and neutrons to move fast enough to go inside other materials?

At LANSCE, scientists have built a special machine that is half a mile long called a linear accelerator (linac). First this machine makes protons (one of the smaller particles) by taking away the electron from a very special atom, called hydrogen, that has only one proton and no neutrons in its nucleus. Then the machine accelerates (speeds up) protons to very high speeds (84% the speed of light!) by using magnets. The magnets push the protons along like you push a swing to make it go higher and higher. When these protons hit a target hard enough, they free the neutrons from the target's atoms.

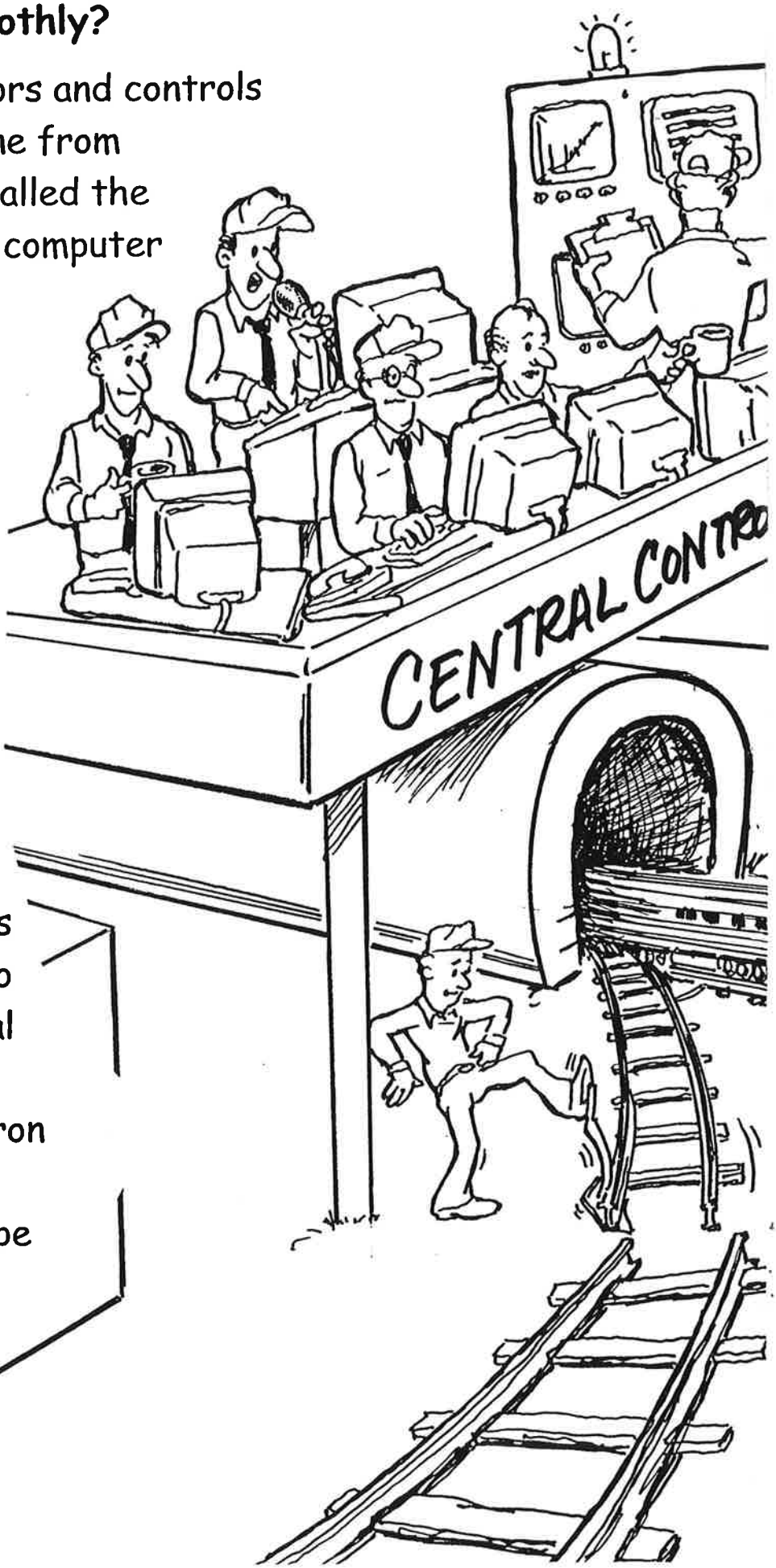


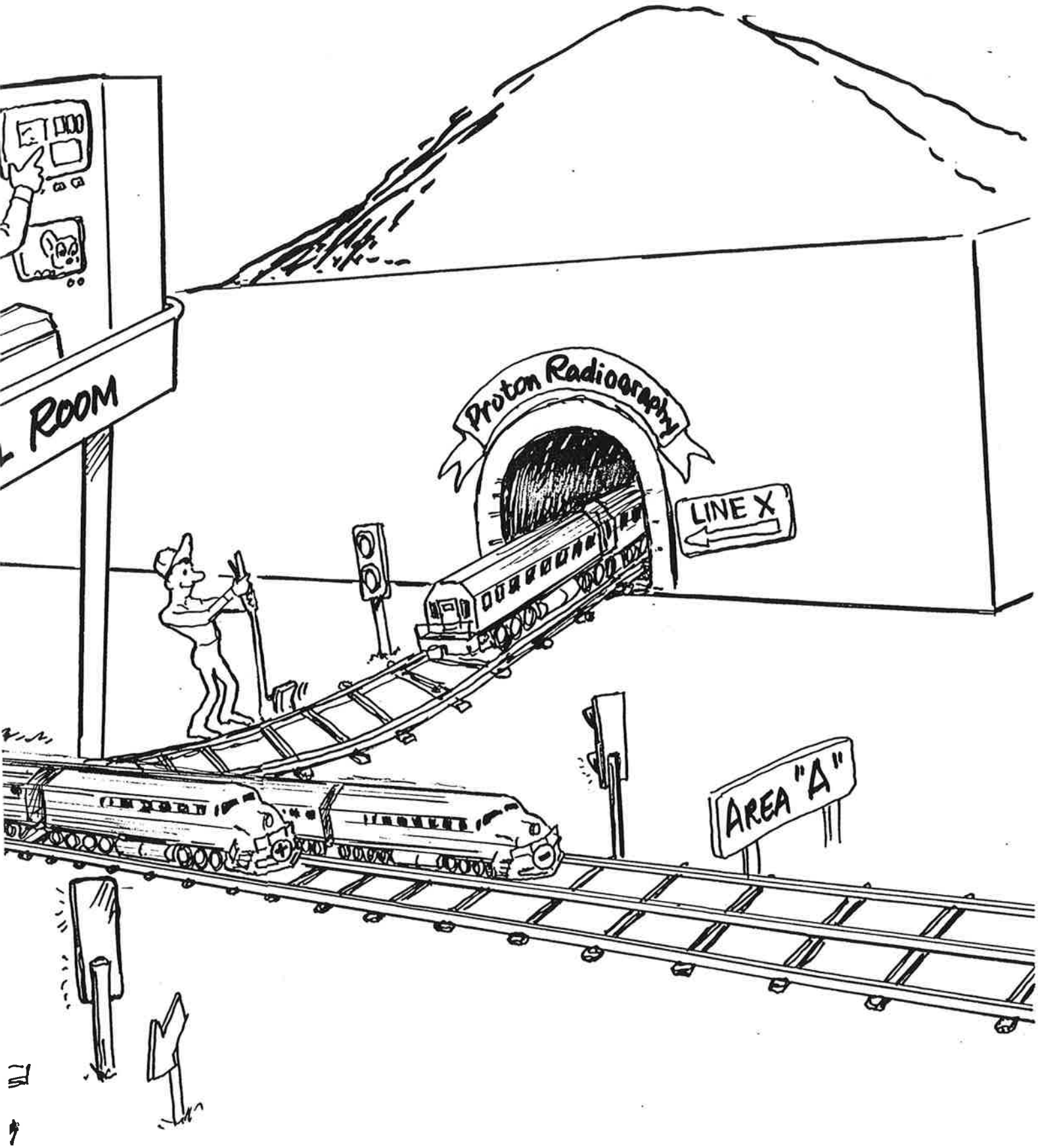
When freed like this, the protons and neutrons have energies of up to 1,000,000,000 volts! (Your flashlight battery only uses 1.5 volts when you turn it on.) A volt is a scientist's measure of how "hot" the protons and neutrons are.

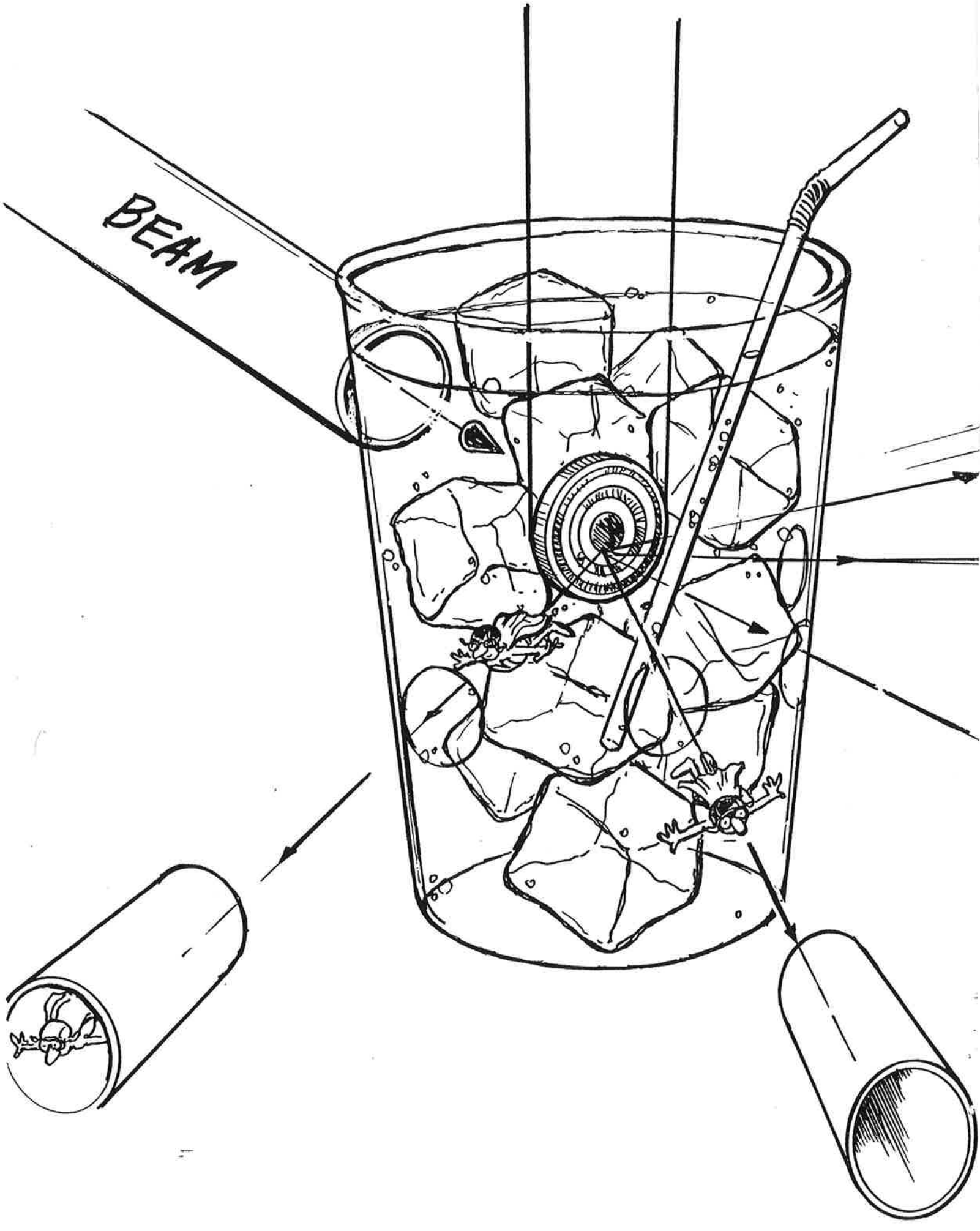


Who operates the accelerator and makes sure everything runs smoothly?

A powerful computer monitors and controls the accelerator. This is done from a special room at LANSCE called the Central Control Room. This computer is connected to many other computers that control all operations involving the accelerator. The Central Control Room is like NASA Mission Control for spacecraft—all processes involving the accelerator are carefully monitored and checked 24 hours a day when the accelerator is operating. The Central Control Room also separates and directs the protons into four different experimental areas, including the Lujan Center, the Weapons Neutron Research Facility, proton radiography, and the Isotope Production Facility.




Proton Radiography
LINE X
AREA "A"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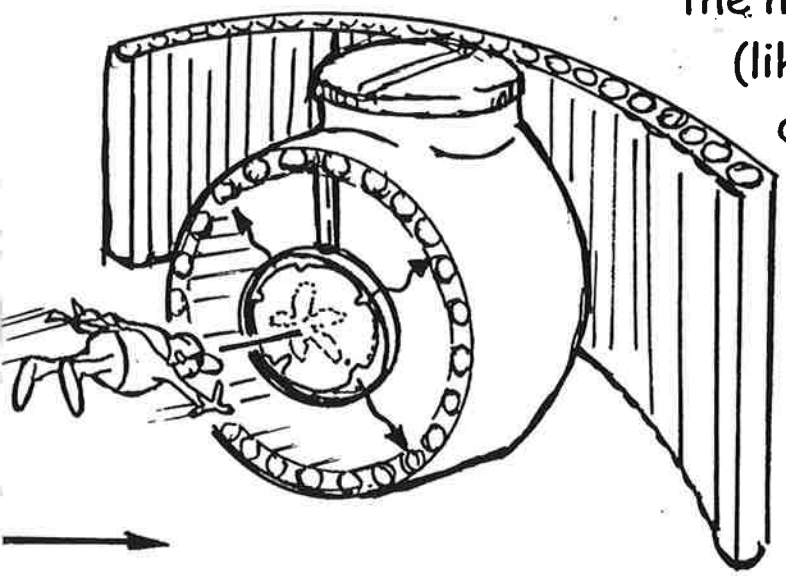
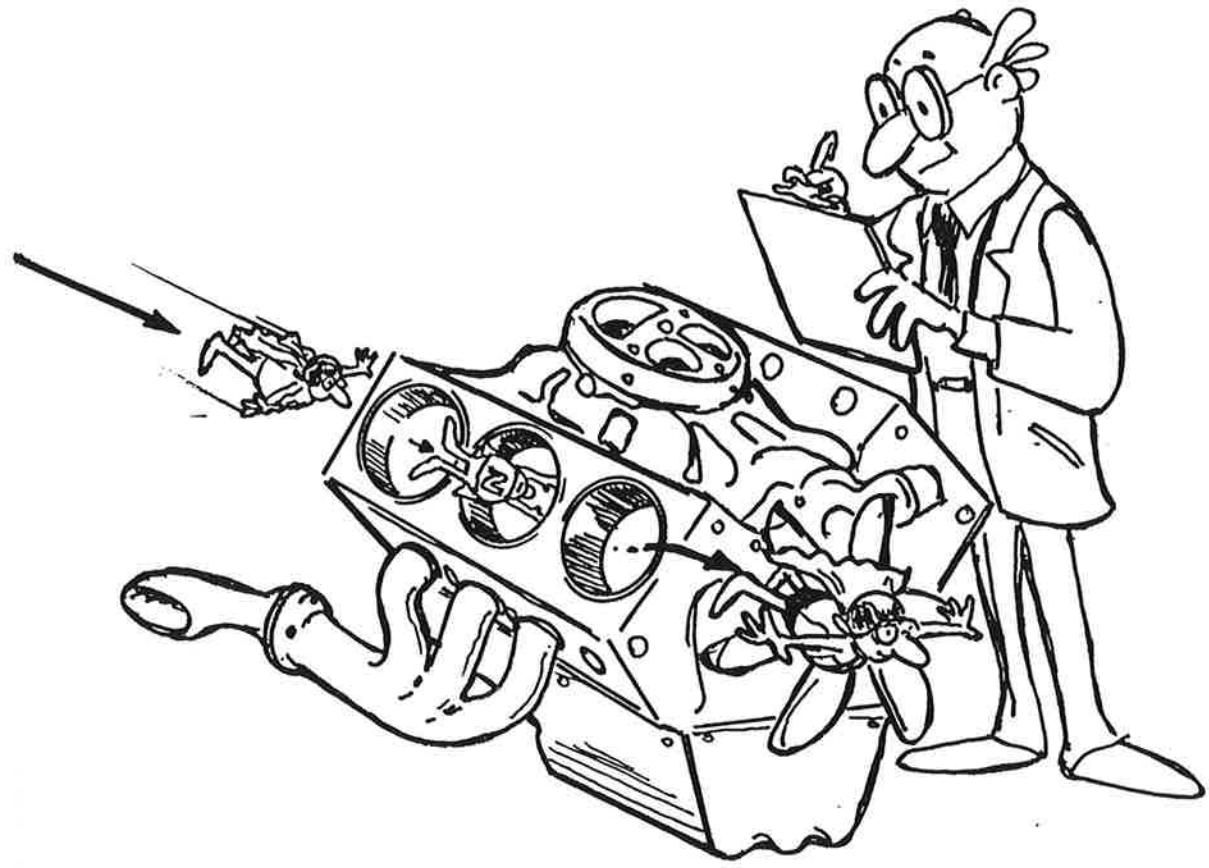
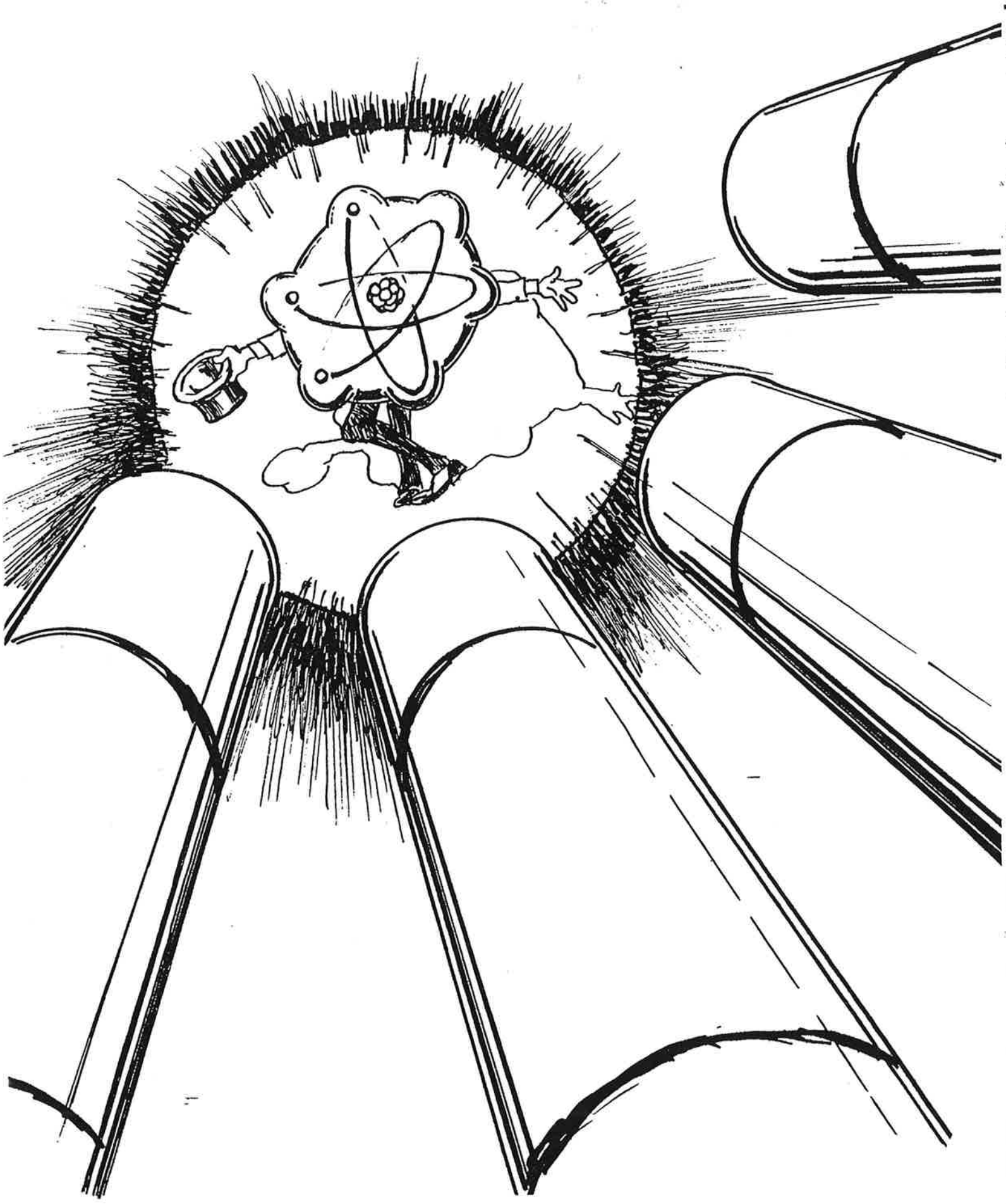
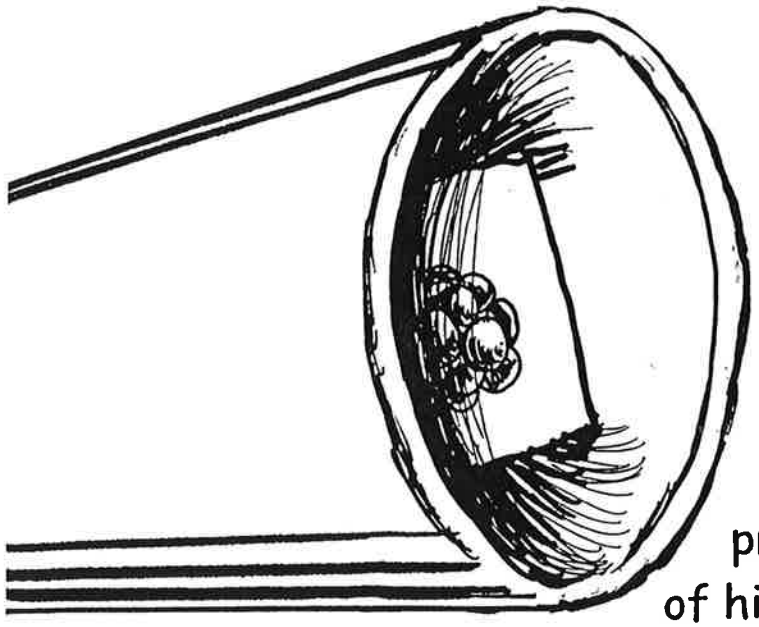
What happens at the experimental areas?

At the Lujan Center, protons from the accelerator hit a special metal target where they free neutrons from the target's atoms. Then the neutrons take a dip in a cold liquid (like water) and cool off to energies of 0.010 volts. These neutrons are directed to various experiments. Scientists use these experiments to learn about the how the atoms are arranged inside materials.



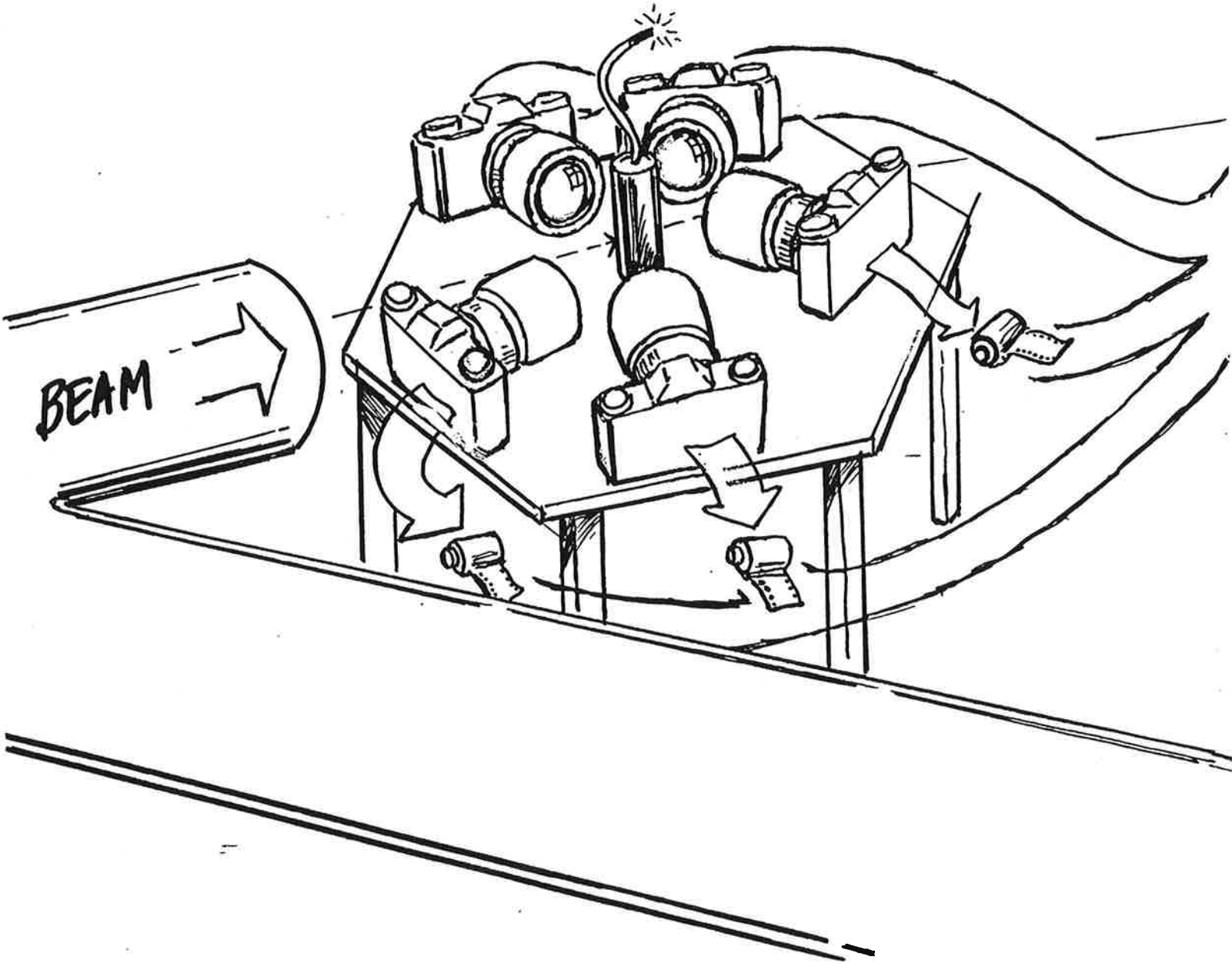


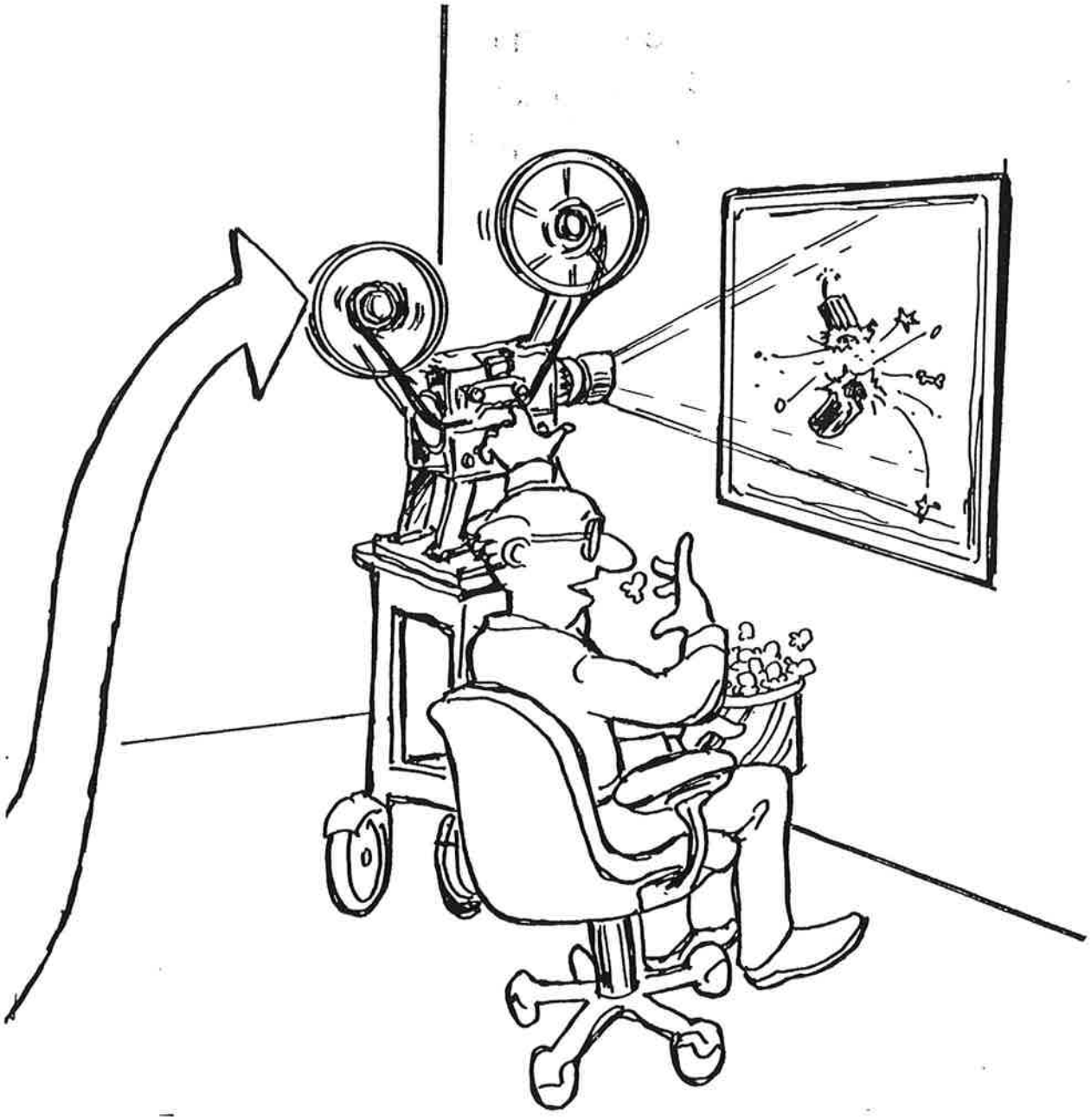




A target at the Weapons Neutron Research facility produces the brightest source of high-energy (100,000,000 volts) neutrons in the world. These high-energy neutrons are used for experiments to find out how the nucleus of an atom is put together.

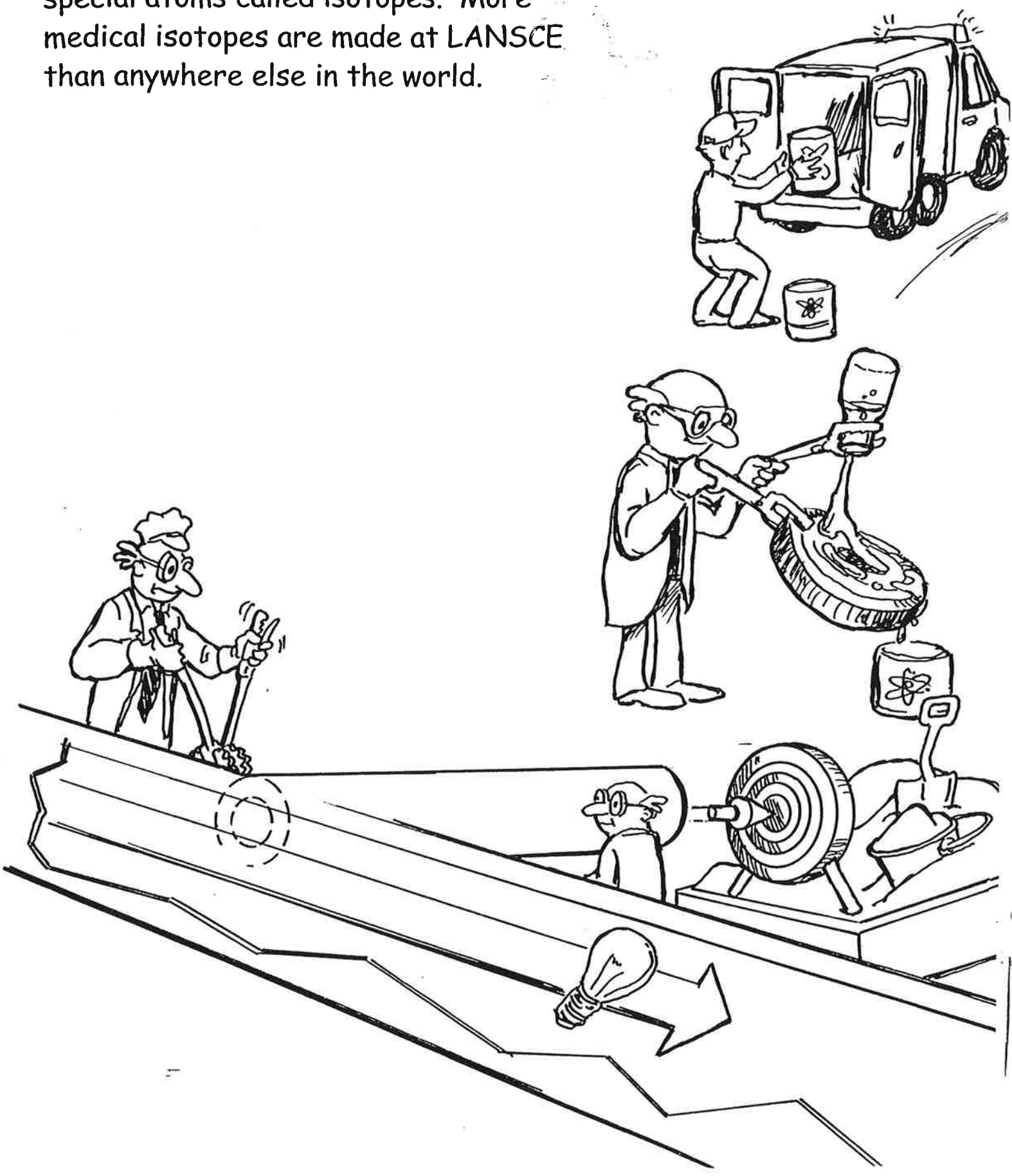
Protons can also be used to look deep inside solid objects. Scientists at LANSCE use proton radiography to understand what happens to an object as it blows up. Protons pass through an exploding object and come out in different directions. Upon leaving the object, these protons hit a special material that makes light.

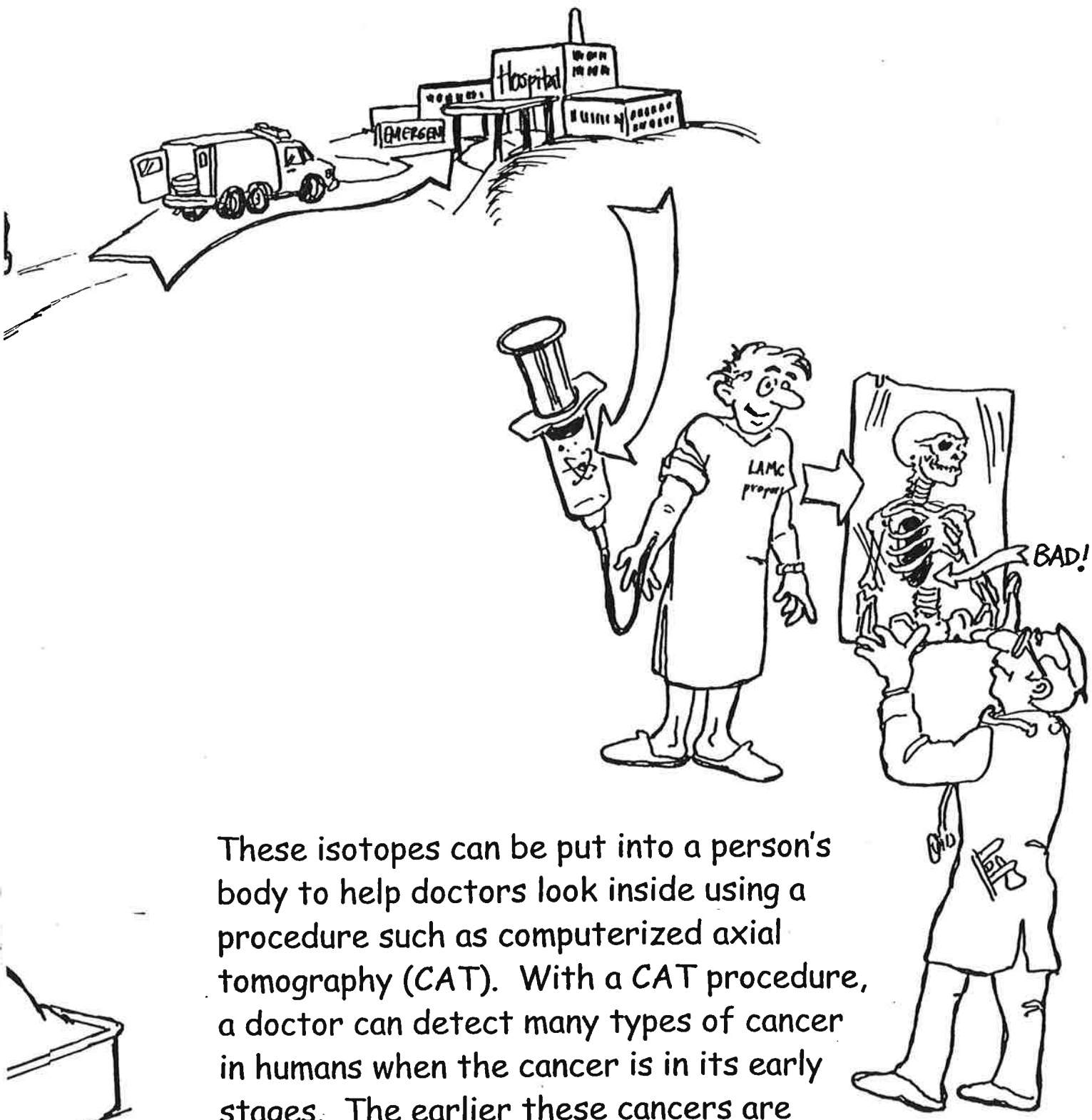




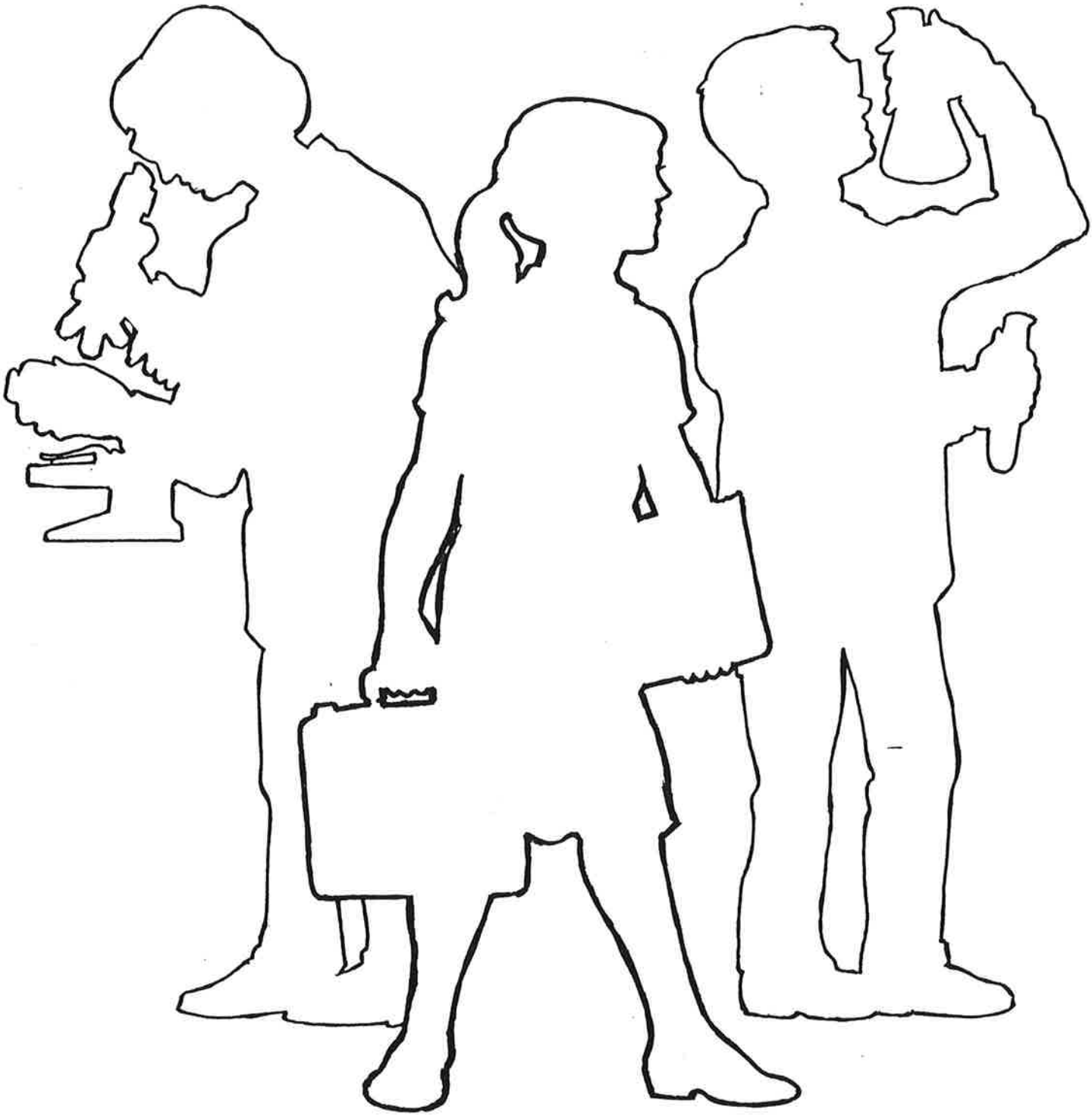
Very fast cameras take photographs of these light images to produce a movie of the exploding object.

The Isotope Production Facility uses the protons from the accelerator to produce special atoms called isotopes. More medical isotopes are made at LANSCE than anywhere else in the world.

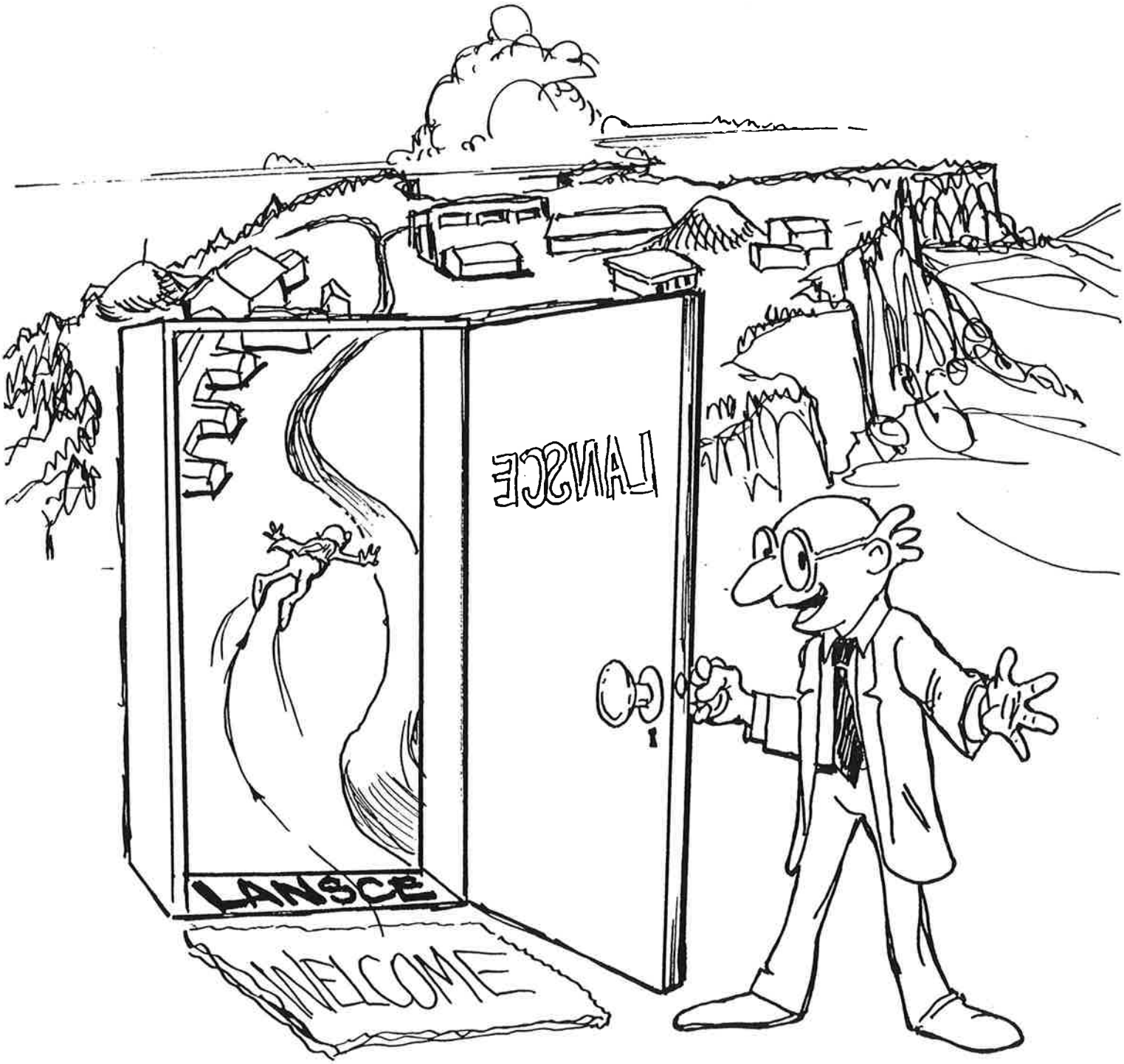


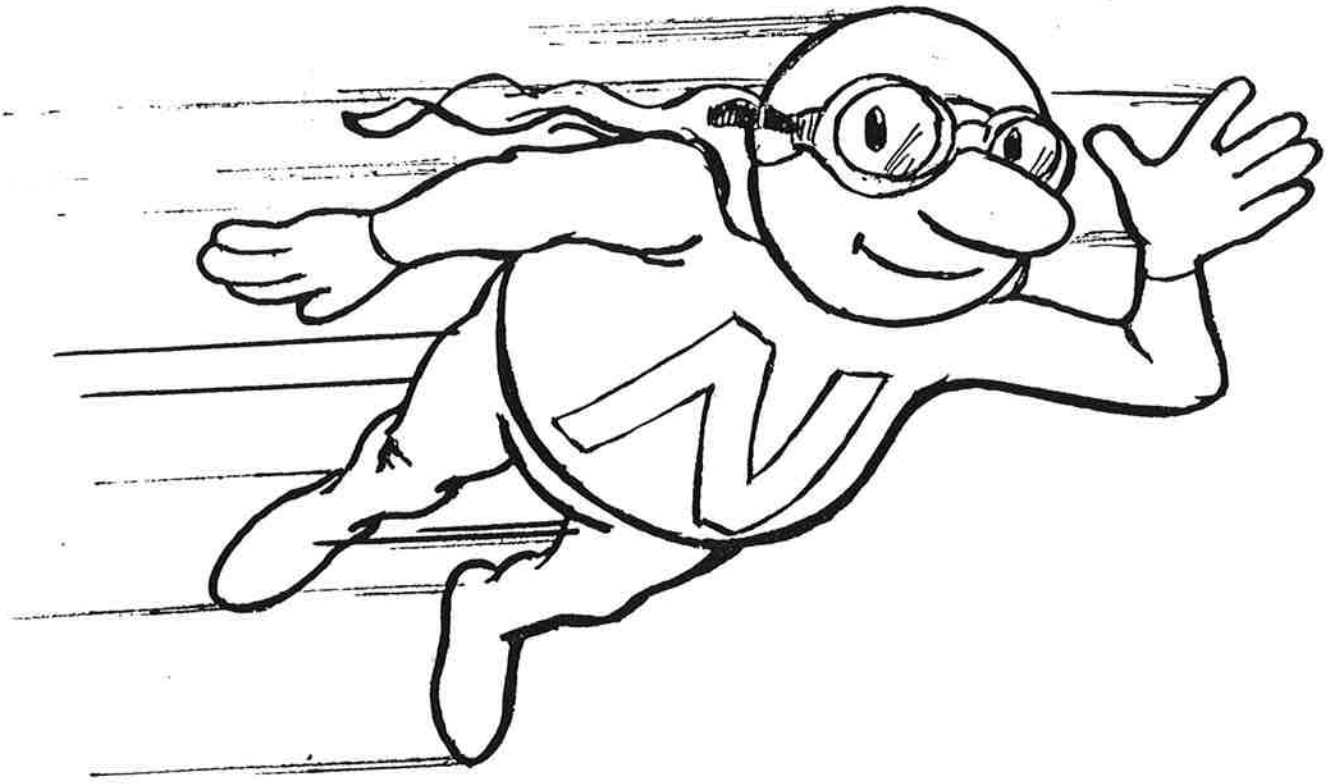


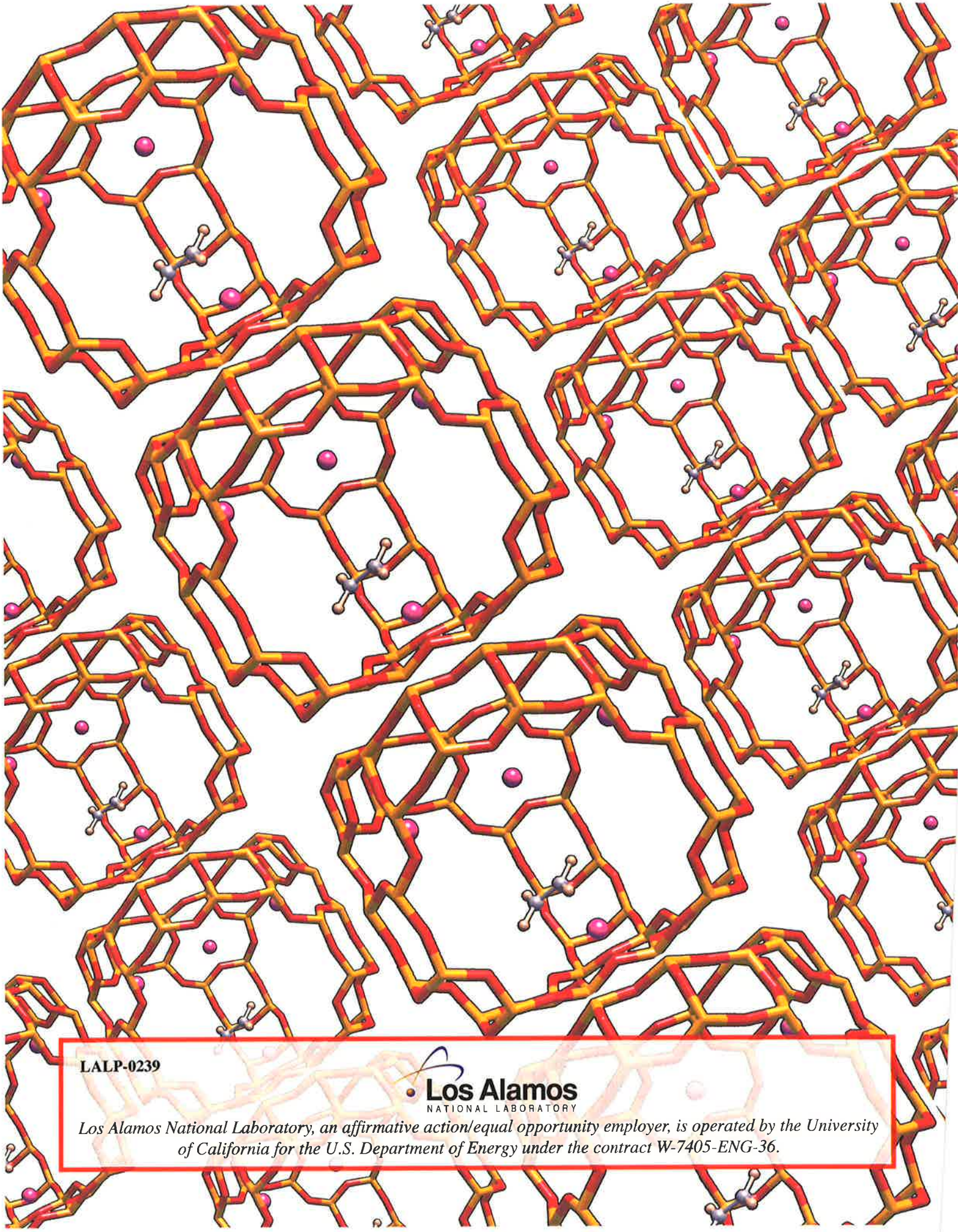
These isotopes can be put into a person's body to help doctors look inside using a procedure such as computerized axial tomography (CAT). With a CAT procedure, a doctor can detect many types of cancer in humans when the cancer is in its early stages. The earlier these cancers are detected, the more likely the doctors can treat the disease.



As you can see, very exciting and great things are happening at LANSCE, and there are many interesting things scientists get to do here. If you enjoy your classes in biology, chemistry, and physics (or other science fields), you may end up doing experiments at LANSCE some day too!







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