



ATOMS AND COSMIC RAYS

WM. H. PICKERING, '32, PH.D., '36

At the present time physicists the world over are directing their efforts to study phenomena occurring inside the atom, or rather inside the nucleus of the atom. At Tech there are groups working on the problem from two directions. In the high voltage laboratory there are two huge porcelain vacuum tubes in which particles can be speeded up electrically until they have energies of nearly a million volts. These high speed particles are then used to bombard atoms and occasionally a direct hit is scored and an atomic nucleus broken up. The pieces of the nucleus are observed by photographing their tracks in a cloud chamber placed just below the target. Study of these photographs thus yields valuable clues to the construction of the original nucleus.

The other general line of attack on the problem is to study the cosmic rays. These rays are essentially a natural source of high speed particles having energies much larger than any that can be produced artificially. Their effects on atoms have been studied by Dr. Anderson, '27 and Dr. Neddermeyer in a cloud chamber placed between the poles of an immense magnet. Their appara-

tus is automatic so that the passage of a ray through the chamber causes a photograph to be taken. By placing plates of various materials across the chamber they are able to investigate the interaction between the high speed particles and the atoms of the plate.

As part of the cosmic ray program under way Dr. H. V. Neher undertook an expedition to India. The purpose of the expedition was to investigate the variation of the cosmic rays with latitude, particularly at very high altitudes. This is done by means of electroscopes carried up by free balloons. The instrument consists of a clockwork mechanism that moves a film on which a record is made of the position of the electroscope fiber, the height of the barometer, and the temperature. To operate the electroscope, a charged condenser is carried along and connected to the fiber at regular intervals. These condensers have been made so that they lose their charge at the incredibly low rate of about 1/10% per hour.

Last summer, observations were made with these instruments in Texas, and they were found to be very satisfactory. Good records were obtained at 80,000 feet and higher. Through the co-operation of the Indian Meteorological Service, arrangements were made for flights from Madras, and last August Dr. and Mrs. Neher set sail for India via Japan and the East Indies.

They found conditions in Madras almost ideal for the experiments, and eleven flights were made. Seven of these have been returned and again the balloons reached heights of over 80,000 feet and good records were made up to the top of the flights.

To carry up the electroscopes used in this work four or five rubber balloons about three feet in diameter are used. After a period of three hours, when the films run out, a release mechanism cuts the instrument loose and it floats to earth on a parachute. In the Indian flights the instruments usually traveled about 60 miles horizontally, but in one case the release apparently failed to work and the electroscope was found over 300 miles away.

DOMES, Hg AND BATHTUBS

E. E. Sechler '28 has been using the heaviest bathtub in Southern California for the past few months. The tub is strange in another respect, it was not built for water but for mercury. Ernie's old friends who have lost track of the schoolboy of yesteryear, should not assume that he has grown to the proportions indicated by the size of his tub. Actually Ernie puts his dome in the tub. This statement should not be confused with the old custom of soaking one's head, for the dome, it should be explained, is a three-foot model of the telescope dome of the future Palomar Mountain Telescope.

The actual dome for the future telescope is to be 135 feet in diameter, and will be fabricated from $\frac{3}{8}$ " welded steel plate. Actually these dimensions place the structure in a class with the modern stressed skin airplane. It might be called a thin skin structure. Since Ernie knows as much about this type of airplane structure as anyone in the country, it became his problem to work the bugs out of the dome.

To solve the problem, an ingenious method was devised by the learned doctor. A model of the dome was spun from a sheet of copper (approx. 0.020"). This model is inverted in a concrete tub which clears the dome by about a half inch. The dome is bolted in place and then mercury is poured into the clearance space. This gives a loading similar to that actually expected. It is then a simple matter to measure the deformations in the dome. The actual design loads on the dome consist of, dead weight, snow load of 60 pounds per square foot, and wind load which is figured at 30 pounds per square foot.