

200 BEV: Beginning or End?

Now that the long, often bitter struggle over the location of the 200 billion electron volt accelerator has been settled (SN: 12/24), physicists still will have a battle on their hands to get started on concrete plans for the giant machine.

Although high energy physicists are convinced of the necessity for building the giant atom smasher, they may have some difficulty explaining to a Congress hard pressed for money exactly why they should have \$10 million for engineering and design studies, and up to \$400 million by the time of completion, for what is essentially a scientific instrument.

High energy physics deals with the world of the extremely tiny and fleetingly brief lifetimes of nuclear particles.

So far the high energy physicists have come up with more questions than they have answered when they shatter atomic nuclei with energetic particles. As they boost these particles to higher and higher energies, they find more and more pieces, without understanding the reason for the plethora.

The number of so-called elementary particles has multiplied in recent years and now stands at some 200, differing from each other in spin, mass, longevity and the like. But there is no theory to explain why there should be so many, why the particles' characteristics should be so varied and their lifetimes so short.

To explore structure on a small scale

—a single atomic nucleus is only a ten-thousandth the size of an atom—and events that occur in time intervals measured in millionths of a second, colliding particles of higher and higher energies are needed as the regions of space and time grow smaller and smaller.

The highest energies available in today's accelerators are just not enough to do more than give slight clues as to what the ultimate structure of matter is, though, as is now the case with the 200 Bev, they once held out hopes for answers.

The 33 billion electron volt accelerator at the Atomic Energy Commission's Brookhaven National Laboratory on Long Island is now the most powerful in the world, followed closely by the 28 Bev machine at CERN in Switzerland.

Both will soon be outclassed by the 70 Bev accelerator now being completed at Serpukhov in the U.S.S.R.

Although the 70 Bev machine may answer some of the questions now being asked concerning the how and why of atomic nuclei, scientists have no doubt that it too will raise as many as it answers. Physicists hope, however, that the 200 Bev proton accelerator will give them a "nuclear microscope" sufficiently powerful to enable them to solve the riddle of how and why matter is put together. And if that doesn't do it, they are already thinking ahead to

the 600-1,000 Bev range—an escalation that can continue until or unless theory develops to create order in the subatomic zoo.

Confidence that the experiments will produce a unified theory is based on the "assumption that nature has absolute laws of great simplicity, from which all the sciences flow in an ordered hierarchy," in the words of Dr. Steven Weinberg of the University of California. Among the sciences highest in this hierarchy now are elementary particle physics and cosmology, and Dr. Weinberg believes that the next discovery bringing us closer to the ultimate laws of nature will almost certainly be made in one of these two fields.

SEISMOLOGY

Amchitka Bomb Test Site


The lonely island of Amchitka in the Aleutian Islands is being eyed again by nuclear energy teams as a possible testing ground for more underground nuclear explosions.

At this moment, surface survey teams of the Atomic Energy Commission are exploring the geological features of this remote island, inhabited only by sea otters. According to plan, the survey teams will soon be followed by crews drilling exploratory holes for possible testing of nuclear warheads. Members of the AEC and the Department of Defense hope to make the island a permanent research station in order to keep closer watch on future nuclear underground explosions set off by Russia.

Amchitka has already undergone one underground nuclear test, on Oct. 29,

1965, when an 80-kiloton atomic device was set off 2,300 feet beneath the earth's surface. Sensitive seismic arrays throughout the world, including the immense earthquake detector in Montana, were "listening in" to vibrations sent through the earth by the explosion in an effort to differentiate any man-made underground explosion from the many natural earthquakes and tremors that constantly shake the earth.

Amchitka is geologically similar to the Soviet testing site across the Bering Sea, in the Kamchatka Peninsula. Though they were miles off in efforts to pinpoint their own October, 1965 Amchitka test, U. S. scientists hope to develop data from further tests which will enable them to locate and identify Soviet tests more accurately.




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