suspects this may be "because the rocks in the crater were not homogenous."

Dr. Chapman is sure that his tektites could not have come from much farther out in space than the moon. If they had spent any appreciable time in space, he says, cosmic rays would have left evidence in them.

"Material traveling in space," he says, "is bombarded by cosmic rays which produce the isotope aluminum 26. The tektites we found don't have this isotope—so we know they didn't travel very far in space."

AEC BUDGET

Accelerator money authorized

Money is one of the most serious problems that physicists face in their projects to build particle accelerators with energies in the range of hundreds of billions of electron volts, and it is the one over which they have the least control.

Last year budgetary problems forced Great Britain to drop out of a European project for a 300-billion-electron-volt (GeV)accelerator (SN: 7/13/68, p. 30), while in the United States the 200-400-GeV National Accelerator Laboratory at Batavia, Ill., was for a while in danger of getting no money at all (SN: 7/27/68, p. 81).

The Atomic Energy Commission had asked Congress for an authorization to spend the whole cost of the project, $250 million, over six years. After much political pulling and hauling, it came out with $14 million for one year.

This year, for fiscal 1970, which began July 1, the AEC is asking for authority to spend the remaining cost of the project, $218 million, over the next five years, and an appropriation of $96 million to be spent this year. And this year the Congressional weather seems fairer.

The Joint Committee on Atomic Energy has recommended giving the AEC authority to spend the whole cost.

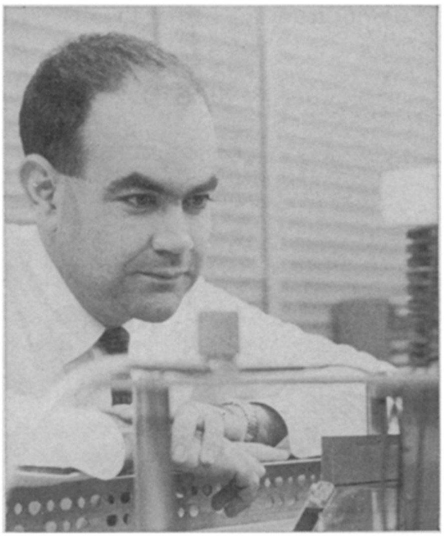
In other parts of the AEC budget, the joint committee authorized more or less what the AEC had asked for (SN: 5/26, p. 399).

In one case, the food irradiation program, the AEC got an authorization it hadn't asked for. The AEC budget submitted by the Nixon Administration would have terminated its program of experiments in preserving food by radiation. The method was once touted as an answer to problems of long-term food storage, but it has problems (SN: 3/22, p. 287). Nevertheless, the joint committee insists that the AEC spend $750,000 in fiscal 1970 on a continuation of food-irradiation research.

The authorization bill passed the House on June 24.

PULSARS

No gammas, no lighthouse



SAO

Fazio: No evidence for radiation.

The study of pulsars has led to a theoretical pulsar model that has recorded a number of striking successes in recent months. The model sees a pulsar as a rotating neutron star surrounded by a magnetized plasma of protons and electrons. Invented to explain radio emanations, the model successfully predicted optical and X-ray pulses as well for the pulsar in the Crab nebula, CP-0532 (SN: 5/31, p. 522).

There has also been some hope expressed that pulsars would give astrophysicists a handle on the decades-old mystery of where the cosmic rays come from. The particles in a pulsar's spinning plasma, the cosmic ray proposition holds, would go faster and faster as they moved away from the surface of the neutron star, until they reached speeds near the speed of light. At that point they would break loose from the confinement of the magnetic field and fly off into the surrounding space.

Such high-energy protons and electrons could be or produce the cosmic ray particles, and only a few objects like the Crab would be able to supply the observed flux of cosmic rays.

The trouble is that the predicted cosmic rays don't seem to be coming from the Crab. Astronomers at the Smithsonian Astrophysical Observatory report that they have been looking for almost a year for high-energy cosmic gamma rays from the Crab, and have not seen any.

Gamma rays are sought because they come straight from the source. Charged particles move in curves, and so the direction of their arrival does not tell where they came from.

Pulsed gamma rays from the Crab have been found at energies around 100,000-electron volts, but these are considered direct radiation from the pulsar rather than cosmic rays. The Smithsonian group searched for rays with energies of about 100-billion-electron volts, "an entirely different ballpark," says Dr. Giovanni Fazio. Gamma rays at this energy should be produced when accelerated particles, spewed out by the rotating pulsar, collide with each other and with other matter in the Crab. Gamma rays produced by this process should also come in pulses like the radiations of the pulsar proper, if they were being produced.

The work by the Smithsonian astronomers, monitoring both the Crab and the pulsar CP-1133, was the first use of a new high-energy gamma ray detector at the Smithsonian's Mt. Hopkins station in Arizona. The detector is an array of mirrors mounted so that together they form a large curved reflector about 34 feet across. It looks for light generated by the entry of high-energy gamma rays into the atmosphere. When such a ray strikes the atmosphere, a shower of secondary particles is produced. These move faster than light moves in the atmosphere, so their motion generates an identifiable kind of light called Cerenkov radiation, which the Mt. Hopkins detector records.

Observation of the Crab and of CP-1133 gave "no evidence for radiation," says Dr. Fazio. "If we could find it, it would verify that cosmic rays are being accelerated."

But the failure may not be conclusive. "That we don't see it," says Dr. Fazio, "may mean that we aren't sensitive enough." He plans to go back for another look in the fall, when the Crab comes back to a position convenient for viewing from Mt. Hopkins.

If the high-energy gamma rays remain unseen, however, the rotating plasma, the so-called lighthouse effect that is used to explain the pulsar pulses, may be in trouble. If the pulsars are not throwing off high-energy particles, it could mean that they are not rotating at all. Alternately it could mean that the particles are escaping the neutron star's magnetic field at much lower energies than was supposed, and if this is true, it makes it hard to see how they could produce the observed radio emanations of the pulsars on their way out. If the nonappearance of the high-energy gamma rays is established, astrophysicists will not only have to continue their search for the origin of cosmic rays. They will have to find another theory to explain the pulsars.