Physical Sciences Notes

ACCELERATORS

Team Proposed for CERN's 300-Bev

Predictions of rapid progress by U.S. physicist Robert R. Wilson have stimulated the European nuclear research CERN to take action of its own.

Dr. Wilson is head of the team that will build and run the 200 Bev accelerator at Weston, Ill., if Congress appropriates the money. He believes the machine can be finished by 1972.

CERN is planning its own 300 Bev machine but has bogged down on the question of where to put it and who will help support it (SN: 9/30); of the 13 member nations of CERN, only Belgium has formally agreed to support the project. The other nations are being asked to commit themselves before the end of the year.

At a session of the CERN council, Prof. Gianpietro Puppi of Italy said a team should be recruited immediately to build the European machine, along with a good man to lead it.

U.S. progress with the Weston machine was made possible by picking a good team before the project was fully approved, says Dr. Puppi, and CERN should follow suit.

ASTRONOMY

New Silica Blanks

Astronomers planning new telescopes, either earth-based or circling in space, now have available an improved backing for the mirrors in their instruments.

The ultra-low expansion fused silica blank does not noticeably change shape between temperatures of 100 degrees below zero C. and 100 degrees above, according to the manufacturer. Although no orders have yet been placed for ULE 7971, produced by Corning Glass Works, Corning, N.Y., the sturdy glass is expected to have both deep space and earth surface uses in the near future.

ASTROPHYSICS

Sun-Like Activity on Other Stars

Stars other than the sun also have sunspot and chromospheric activity, two astronomers at Mt. Wilson and Palomar Observatories have found. They made a two-year survey of 150 stars selected because they had a surface temperature close to that of the sun.

Drs. Harold Zirin and Arthur H. Vaughan Jr. found that the sun is evidently much less spectacular in its outbursts than the stars they studied. But activity is patchy across the stars' surfaces and varies in intensity, as is true of the sun.

Most of the 150 survey stars, observed with the 200-inch Hale telescope atop Mt. Palomar, were examined because of indications of peculiar activity in the chromosphere, the transparent atmosphere above the bright photosphere. This had been found earlier by Dr. Olin Wilson, also of the Observatories.

To detect the transparent atmosphere, the astronomers used a device that screened out all wavelengths except the infrared radiated by excited helium atoms, the one most likely to reveal an atmosphere and its activity.

The evidence of variable, sunspot-like activity in the survey stars was the change in intensity of the helium spectral line over the 24 months. In some instances, the line intensity varied markedly within a year, depending not upon the size of the star but on its surface temperature.

PARTICLE PHYSICS

The Hunting of the Quark

Physicists find that they can explain many of the properties of nuclear particles by assuming that these are made up of even more elementary particles called quarks. The ultra-basic particles would be unique in having electric charges smaller than the unit charge on an electron or proton.

One problem with quark theory is that no quark has yet been detected. It has been assumed that quarks are so massive it would take extremely high energy, such as that available in proposed 200 and 300 Bev accelerators, to overcome the force which holds them together.

A theoretical explanation of quarks that gets around the non-detection problem has been developed by Dr. Leonard I. Schiff of Stanford University and reported in the Aug. 25 PHYSICAL REVIEW.

Working from the idea that the charge on a particle comes from a magnetic pole that extends through that particle, Dr. Schiff developed a theory of quarks that would allow them to move within the particle but never permit them to appear as individuals.

Dr. Schiff's model puts no requirements on the mass of quarks or the forces holding them together. So it is reasonable to assume they are about a third the mass of a proton, since a proton contains three quarks, he says.

CRYOGENICS

Helium as a Superfluid

When a normal liquid is swirled in a container, it rotates. Liquid helium does too, down to a certain point. But below minus 271 degrees C. it stops rotating, according to two Stanford University physicists.

In fact, according to experiments by Drs. G. B. Hess and W. M. Fairbank, if a slowly rotating cylinder of helium is cooled beyond that critical temperature, the angular momentum of the helium is transferred to the container, which then rotates faster than it did before. Dr. Hess reported the theoretical explanation of the effect in the Sept. 5 PHYSICAL REVIEW.

The superfluid behavior in helium (SN: 9/16) is a physical effect similar to the electrical phenomenon of superconductivity in some materials at very low temperatures.

In superconductors, resistance to an electrical current below the critical temperature is zero. In superfluid helium, the viscosity of the fluid becomes zero.

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