PHYSICS

Proton Structure Jelly-Like

Protons and neutrons do not have a hard core as scientists have so far believed, but a jelly-like structure, contrasting with the electron's point charge.

➤ PROTONS AND NEUTRONS, the building blocks of atoms that account for virtually all of the weight of matter in the universe, have a jelly-like structure, a Harvard University physicist reported.

Dr. Richard Wilson told the American Physical Society meeting in New York that experiments with the Harvard-M.I.T. Cambridge Electron Accelerator had yielded "no sign" of a hard core within the atomic nucleus, as scientists had thought existed.

The experiments consisted of hurling electrons with high energies at targets of hydrogen, then measuring how the electrons were swerved off their course by the electric charge of the hydrogen nucleus. The same kind of experiment was also done with deuterons scattered by heavy hydrogen.

Both experiments showed that the proton and neutron have a spread-out structure. This is in contrast, Dr. Wilson noted, to the electron—negatively charged carrier of electricity—which behaves like a point charge to the smallest distances yet measured.

Dr. Wilson said this difference between the structure of the proton or neutron and the electron is probably due to the fact that the former nuclear particles interact strongly with each other and with other particles, such as mesons. Electrons only interact weakly.

Discovery of the jelly-like structure of the proton may mean an end to the continual search for structures of smaller and smaller size, Dr. Wilson suggested. There is no evidence to indicate that the proton is built up of smaller, well-defined subunits.

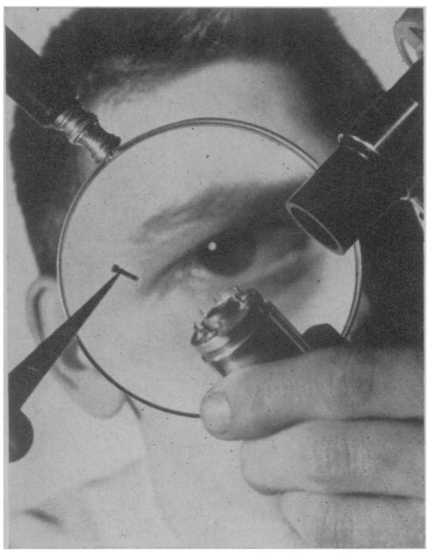
Dr. Roy Weinstein of Northeastern University, Boston, reported that he had used the energetic electron beam of the same accelerator to create mu mesons and to look for evidence of substructure.

The mu meson is very similar to the electron, except that it weighs about 200 times more. The electron and the mu meson are among the least complicated of the so-called elementary particles.

No substructure was found at distances of four-one-thousandth of a millionth of a millionth of an inch, or larger. At these distances the mu meson still behaves like a mathematical point.

The detailed paths of the mu mesons were investigated, and the results were compared to the most accurate theory of nuclear physics available, quantum electrodynamics, or QED for short. The results demonstrated that QED is still valid for distances as small as four-one-thousandth of a millionth of a millionth of an inch.

• Science News Letter, 85:69 Feb. 1, 1964



Raytheon Company

SPACE-AGE ACCELEROMETER—The spool-sized accelerometer which helped place Syncom II communications satellite into synchronous orbit contains 176 tiny parts and is assembled with the aid of a magnifying glass at Raytheon Company's Lowell, Mass., plant. The accelerometer measured acceleration levels during burning of the apogee-kick motor.

PHYSICS

New Way Found to Send Information on Beam

➤ A NEW WAY to make the tight light beam of a laser carry information has been discovered.

Just as radio waves must be modulated to carry sound or other information, so also must light beams.

However, because light has a frequency many millions of times higher than radio waves, finding a way to modulate it is difficult.

A stack of crystals of potassium dihydrogen phosphate will do the job, the American Physical Society meeting in New York was told. Zinc sulfide crystals can also be used, Drs. R. A. Myers and P. S. Pershan reported.

They did their studies at Harvard University, but Dr. Myers is now at the International Business Machines Watson Research Center, New York, and Dr. Pershan is on leave at Bell Telephone Laboratories.

The trick is to rotate each crystal 90 degrees with respect to the one above and below it and to make the stack just high enough so that the electric field reverses itself in the time light takes to pass through one crystal. This modulates the light.

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SPACE

Relay II Communications Satellite Successful

➤ THE U. S. GOAL to establish a worldwide space communications network may soon be realized with the successful launching of the newest communications satellite, the eight-sided Relay II, on Jan. 21.

The "space switchboard" satellite, which is expected to receive and transmit radio television signals to four continents, successfully relayed, on its fourth orbit, voice and technical tests to Raisting, West Germany, from Nutley, N. J.

On the satellite's first orbit, radio voice communications and television test patterns beamed from Mojave, Calif., were transmitted back immediately to Mojave and the station at Nutley.

Relay II is an active communications satellite unlike the Echo satellites which serve only as reflectors of signals.

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SPACE

Space Data Translation Speeded by New Device

➤ A LITTLE electronic translator has been added to Navy satellites to reduce from weeks or months to hours the time it takes to convert data from space into usable scientific information.

The Johns Hopkins Applied Physics Laboratory, Silver Spring, Md., which invented the system, said that after a recent Navy launch, scientists got more than 50 different kinds of information within the first 12 hours.

The laboratory said the information was analyzed, checked and printed out during that time.

Key to the new sysetm is something which Johns Hopkins space scientists call an "information conditioning unit." This unit, otherwise known as an "analog-to-digital-converter," flies into space aboard the satellite.

The moment the satellite's sensors start picking up information about conditions in space, the translator goes to work on the data, converting it into a form "readily understood" by a high speed computer waiting to digest it on the ground.

• Science News Letter, 85:69 Feb. 1, 1964

TECHNOLOGY

New Silicone Rubber Withstands Intense Heat

➤ A NEW SILICONE rubber that withstands intense heat better than steel and may someday shield military personnel from the scorching rays of nuclear weapons has been developed by the General Electric Company in Waterford, N. Y.

Used to seal U.S. astronauts into the Mercury space capsules, the rubber is produced as a liquid and poured into place. When solid, it can withstand temperatures up to 9,000 degrees Fahrenheit, temperatures that pierce holes in steel in seconds.

• Science News Letter, 85:69 Feb. 1, 1964