PHYSICS

Nobelists Study Hydrogen

Energy levels of the simplest atom, hydrogen, are being probed with radio waves in continuing studies by the two most recent Nobel Prize winners in physics.

➤ THE TWO most recent Nobel Prize winners in physics, Drs. W. E. Lamb of Stanford University, California, and Dr. P. Kusch of Columbia University, New York, reported their most recent attempts to learn about the hydrogen atom's structure at the American Physical Society meeting in Washington.

Previous studies of the same subject brought their joint Nobel award in 1955. Both now find their recent measurements do not agree exactly with theory, but they expect differences will be explained by further tests.

Both are using radio waves to learn about the energy levels of the hydrogen atom, which consists of an electron (very light negatively charged particle) whirling around a proton (positively charged particle about 1,850 times heavier than the electron).

Dr. Lamb explained his work as follows: When hydrogen atoms in a gas at low pressure are bombarded with high-energy electrons, they pick up energy, putting them in what physicists call an "excited state." They return to a lower state by giving off light, some of which is visible, some of which is ultraviolet.

There are several different excited states of hydrogen resulting from the electron barrage. Hydrogen atoms reaching each of these states remain there for a definite time and give off a particular wavelength of light when they fall back to the original state. The number of hydrogen atoms in each state determines the brightness of the light so emitted.

By applying radio waves to the excited hydrogen atoms, the brightness of the visible or ultraviolet light given off can be changed. From the frequency of the radio waves causing the changes, the energy differences of the levels can be determined.

Preliminary measurements, Dr. Lamb said, are in "rough agreement" with theory.

The energy levels of excited hydrogen atoms are also being investigated by Dr. Kusch, who is studying relatively long-lived, or metastable, states. Of the various metastable states that hydrogen atoms attain, some levels last much longer than others.

Dr. Kusch is investigating the energy difference between two minutely spaced sublevels of metastable hydrogen, both of the ordinary variety and of heavy, or double-weight, hydrogen. He is determining the energy with which these two kinds of hydrogen interact with the magnetic field produced at the nucleus by the circling electron.

Science News Letter, May 5, 1956

PHYSICS

Fission Understood Soon

➤ ESSENTIAL FEATURES of the splitting of uranium atoms to release large amounts of energy, now a mystery despite atomic bombs and piles, will be understood within a year.

Knowing the basic mechanism of fission is of "prime importance" to the atomic energy field, Dr. D. J. Hughes of Brookhaven National Laboratory, Upton, N. Y., told the American Physical Society meeting in Washington.

Release of previously secret information at the Geneva Atoms-for-Peace Conference last summer, he said, "greatly advanced" understanding of the fission process, and should lead to solving the problem very soon.

Basic question being studied at Brookhaven and other laboratories throughout the world is whether, at the very moment a uranium atom splits, its break-up is a complicated or a simple process. Dr. Hughes said Brookhaven experiments indicate fissioning is a simple mechanism, but that explaining the "several hundred distinct products" produced from the splitting is then difficult.

Since discovery of fission in 1939, Dr. Hughes said, scientists have thought the process was one in which the energy that a uranium nucleus gains when hit with a neutron appears as heat, that is, very complicated motions of the nuclear particles. If this is so, then fission would take much less time, measured in tiny fractions of a second, than present experiments indicate.

Now scientists believe the energy transferred to uranium by a neutron changes the shape of the nucleus rather than adding heat to it.

Evidence for this is that only neutrons of particular energies are effective in causing fission.

A blending of the complicated and simple picture is the one Dr. Hughes expects will account for all observed phenomena relating to fission.

Science News Letter, May 5, 1956

• RADIO

Saturday, May 12, 1956, 2:05-2:15 p.m. EDT

"Adventures in Science" with Watson Davis, Director of Science Service, over the CBS Radio Network. Check your local CBS station.

Stanley Ruttenberg, assistant program officer of the U. S. National Committee for the International Geophysical year, will discuss "Discoveries in Our Atmosphere."

VETERINARY MEDICINE

Dwarf Cattle Increasing Fast

➤ THE NUMBER of dwarf cattle being born is increasing so fast that soon one beef calf out of about every seven may be a dwarf, according to the American Veterinary Medical Association in Chicago.

Dwarfism is inherited. To eliminate it, breeding cattle carrying the dwarf genes must be identified. No completely effective, economical method for doing this has been developed, but an X-ray technique now being studied shows promise. Chief difficulty with the technique is lack of a standard means of interpreting the X-ray.

Everett J. Warwick, head of the U. S. Department of Agriculture's cattle research section, predicts dwarfism will continue to be a problem for the remainder of the century.

Science News Letter, May 5, 1956

EMBRYOLOGY

Warns on Pinpointing Special Cancer Cause

➤ A WARNING against pinpointing the start of cancer to a particular chemical or a virus or even genes was issued by Dr. Johannes Holtfreter of the University of Rochester, N. Y., at the meeting of the National Academy of Sciences.

Just as the season and the condition of the soil when a farmer sows his seed are important for harvesting a crop, so the time and the condition of the host organism are important for development of cancer from a cancer-causing stimulus.

Cancer-causing chemicals start cancerous growth of various kinds when applied, for example, to the tadpole stage of an amphibian such as a frog. When acting during early embryonic stages before the tadpole stage, however, these same chemicals induced the formation of normal structures such as those that will develop into ears, glands and kidneys, Dr. Holtfreter reported.

His studies were undertaken to help answer some "crucial" questions in embryology. To what an extent does an external stimulus determine a specific reaction from a living organism? Is the outcome due to the kind of stimulus or to the special way some part of the living organism responds?

The situation is so complex, Dr. Holtfreter believes, that much more fundamental knowledge is needed before scientists can tell about the start of cancer.

Science News Letter, May 5, 1956