

CHEMISTRY

Complex Hydrogen Ion Confirmed

► THE EXISTENCE of a complex hydrogen ion that has long been the bane of any person who has studied chemistry in high school or college has been confirmed.

There is no longer any doubt that hydronium ions exist in water solutions and students will have to reconcile themselves to giving the troublesome ion due consideration in their attempts to balance complicated chemical equations.

Drs. Michael Falk and Paul A. Giguere, Laval University, Quebec, Canada, confirmed the presence of hydronium ions, H_3O -positive, by infrared spectroscopy.

They believe refinements in their techniques may make possible more accurate determinations of the degree of ionization, or "strength," of strong acids in concentrated solutions. Until now such measurements could be made only indirectly and frequently without precision as to results.

For more than 50 years the hydronium ion has been only a concept found useful in explaining otherwise confusing results in setting up some chemical equations.

Students have been told water in most solutions breaks up to form H -positive hydrogen ions, written as H followed by a superscript plus sign. This simplified expression has served well to fill in gaps in equations, but sometimes fails to complete more complicated expressions.

High school and beginning college students usually are told to try to visualize the complicated reactions as cases in which a water molecule subscript, H_2O , attaches a H -positive ion to form H_3O -positive and the equations can be completed. A drawback has been that students tend to forget the complex breakdown of water in ionic solutions because there has been no proof of hydronium ion existence. Some chemical educators have doubted the ion's existence, making the student's task even more difficult.

Science News Letter, November 16, 1957

ENDOCRINOLOGY

Find Hormone Shots Give Rats Hardened Arteries

► INJECTIONS of the hormone ACTH have been found to produce extreme hardening of the arteries in rats, a species that is naturally immune to the disease.

This finding will help speed research on the cause of heart disease in man, Drs. Bernard C. Wexler and Benjamin F. Miller, May Institute for Medical Research, Cincinnati, Ohio, reported to the American Heart Association meeting in Chicago.

Special feeding has not been successful in producing artery-hardening in rats although injections of large fat-bearing molecules taken from human blood plasma have been reported to be effective in clogging rat arteries with deposits similar to those seen in humans.

Doses of ACTH, an adrenal-stimulating hormone produced by the pituitary gland,

were given to the rats and produced damage resembling that found in extreme senility in human beings. The arteries were dilated, with bulges or sagging pockets in the walls resulting from loss of elasticity.

These changes, however, occurred only in female rats. In male rats there was inflammation of the arteries but no hardening of the arteries.

Another finding was that the ACTH did not cause the rats' blood to become enriched with fat; they were not being fed a diet containing excessive amounts of fat.

This is noteworthy because of the concern in recent years on the possible role of fats in causing hardening of the arteries, the scientists reported.

Rats are convenient laboratory animals to work with because they are easier to house and maintain and can be used in greater numbers than larger animals.

Nutritionally speaking, the rat is more closely related to man than the often-used vegetarian rabbit.

Science News Letter, November 16, 1957

CHEMISTRY

"Free Radicals" as Rocket Fuel Increase Thrust

► "SIGNIFICANT increases" in rocket engine performance are possible if "free radicals" are used as fuel, Dr. George Moe of the Aerojet-General Corporation has reported.

"Free radicals" are molecular fragments that exist only momentarily unless frozen at very low temperatures. They represent the most concentrated form of chemical energy yet discovered and a possible energy source in the future.

The atoms and radicals could be introduced into the rocket in combination with a suitable working fluid such as hydrogen, Dr. Moe told the Symposium on The Formation and Stabilization of Free Radicals held at the National Bureau of Standards, Washington.

The heat of the radicals' reactions would raise the temperature of the hydrogen to that necessary for operation, he said. The highest thrust available from ordinary chemical propellants, Dr. Moe reported, is from 350 to 400 pounds from each pound of fuel every second.

Using the heat of reaction from such free radicals as NH , CH or atomic hydrogen would boost the thrust to more than 400 pounds every second.

The Symposium is sponsored by the Bureau of Standards, the Applied Physics Laboratory of Johns Hopkins University, the Catholic University of America and the University of Maryland.

Free radicals in the atmosphere are being studied as the power source for a solar rocket that would circle earth indefinitely some 60 or 65 miles above the surface.

In the body's biological processes, Dr. Barry Commoner of Washington University, St. Louis, Mo., reported to the Symposium, free radicals play a "decisive" part. They form a molecular bridge between the extremely speedy chemical steps that power plant and animal life.

Science News Letter, November 16, 1957

IN SCIEN

ASTRONOMY

Earthquakes on Moon Cause Dust Storms

► MOONQUAKES cause dust storms that fill the bottoms of the moon's craters, a U. S. scientist reports.

Dr. John J. Gilvarry of the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., says the moonquakes, equivalent to the 1897 earthquake in Assam, would have to occur only once every million years to fill the crater bottoms. In contrast, such very strong quakes occur every few centuries on earth, he reports in *Nature* (Nov. 2).

The moonquakes are a "major erosive agent," capable of reducing surface rock to rubble, then finally to fine particles and dust, Dr. Gilvarry concludes. Moonquakes also account for the smooth surfaces of the maria, the dark areas that form the face of the "man in the moon."

One current theory is that the moon's pockmarked face results from the smashing of meteors into its surface, and the maria are thought to be meteoritic craters considerably larger than usual.

Science News Letter, November 16, 1957

MEDICINE

Maggot Washings Contain Antibiotic

► A NEW antibiotic has been found in the washings from maggots, Drs. E. R. Pavillard and E. A. Wright, St. Mary's Hospital Medical School, London, England, report in *Nature* (Nov. 2).

The maggots, young larvae of the black blow-fly *Phormia terraenovae*, after being fed raw meat were sprayed with distilled water every ten minutes over a period of three hours. When the washings were sterilized and diluted with a culture medium, they showed antibiotic action against several types of bacteria, including those causing pneumonia and streptococcus infections.

In past years maggots themselves have been used to cleanse wounds and were believed to have a three-fold action within a wound: removal of the dead tissue by means of enzymes, stimulation of new tissue growth, and reduction of wound infection.

It was the ability to reduce infection that led the scientists to investigate the possible existence of an anti-bacterial agent.

Further purification of the substance is needed to increase the strength of the antibiotic and to understand its basic chemistry, the scientists report.

The exact source of the antibiotic is not known, although it appears to be a product of the larvae themselves and not of microorganisms associated with them.

Science News Letter, November 16, 1957

CE FIELDS

PHYSICS

Can Build Atomic Reactor Incapable of Exploding

► AN ATOMIC reactor that will eliminate the danger of explosions can be built using a radically new device called the "convergatron."

Dr. Lyle B. Borst, New York University physicist, reported to the American Nuclear Society meeting in New York that two new types of atomic power plants had been designed using the convergatron. One is a fast neutron breeder reactor, the other a natural uranium and water system.

Uranium and water cannot produce a full chain reaction regardless of their proportions, but they do make an efficient power plant with the convergatron. Dr. Borst said this system would never have a full chain reaction. It could be operated by adding a few neutrons amplified to the level required for power production.

The convergatron is a neutron amplifier in which the neutron output is greater than the input. In a manner related to that of the vacuum tube, it magnifies the flow of neutrons. A series of convergatrons would amplify neutrons from a weak source to a large power reactor, yet the power plant itself would shut off upon removal of the source. Because all parts are sub-critical, there is no danger of losing control of the chain reaction.

The convergatron consists of three sections: one containing the pure neutron moderator such as plain water or graphite, one containing atomic fuel such as uranium-238, and a thermal neutron barrier such as cadmium.

Science News Letter, November 16, 1957

PUBLIC HEALTH

Doctors to Mail Polio Reminder Cards in Color

► PEOPLE STILL needing polio vaccine shots may soon receive a colored "reminder" card in the mail from their doctor.

This was announced in an editorial in the *Journal of the American Medical Association* (Nov. 2) which says the cards are being supplied free to all doctors as part of the Association's "operation cleanup" in its polio inoculation campaign.

Persons under 40 years of age who have not yet been inoculated or who have not completed their series of three shots will receive an orange card. Those ready for their third shots will get a blue one.

The cards are designed to round up all the stragglers that have not yet been motivated by previous efforts. There are still 37,000,000 who have had no vaccine at all, and another 44,000,000 who need second or third injections.

Most of these people need only a "gentle word of advice from the man most con-

cerned with their health, their own doctor" about the need for and value of polio shots, the editorial says.

The American Medical Association hopes that "operation cleanup" will help bring polio closer to the point already reached with whooping cough and diphtheria, where polio vaccination is a part of the general routine for infants and children.

Science News Letter, November 16, 1957

BIOCHEMISTRY

Even Seaweed Has Cholesterol Problem

► CHOLESTEROL, believed to be a problem for man and animals only, has just been found in vegetables.

Three Japanese scientists of the University of Tokyo and of the Sankyo Company, Tokyo, report discovery of the fat-like substance in several red seaweeds.

Chemical and X-ray analysis of a compound in the seaweed proved it to be cholesterol. The finding was reported in *Science* (Nov. 1) by Kyosuke Tsuda, Saburo Akagi and Yukichi Kishida.

Cholesterol had been found in all animal fats and oils and is closely associated with arteriosclerosis. Its exact relationship with heart disease has not been determined.

Science News Letter, November 16, 1957

MEDICINE

Cancer Growth Stopped By Cow Ovary Extract

► CANCER GROWTH in mice has been stopped with an extract taken from cow ovaries, Drs. L. V. Heilbrunn, T. R. Tosteson and E. Davidson of the University of Pennsylvania, and Dr. W. L. Wilson, University of Vermont, Burlington, report in *Nature* (Nov. 2).

As many as 25% of cancer-bearing mice survived "indefinitely" after they were treated with salt solutions containing the extracts, whereas untreated mice almost always died from the implanted cancers.

The ovary extracts are believed to keep the protoplasm of the individual cancer cells in a fluid state, and thus prevent the "gelling" that is necessary if cell division is to take place.

Recent work with the extracts has given even more impressive results, with higher percentages of survival than 25%.

The scientists report they had been preparing extracts from cow ovaries for several years, in the hope that they would show cancer-stopping ability. They were unsuccessful until they used alcohol to precipitate the extracts.

The extracts were then tested in more than 4,000 mice that had received implants of a very lethal type of tumor.

When added to sea water, one of the extracts prevented both clam and worm eggs from developing.

The research was supported by the American Cancer Society, the National Cancer Institute and the National Science Foundation.

Science News Letter, November 16, 1957

METALLURGY

Scientists Develop Ceramics That Bend

► SUCCESS in obtaining ceramic materials that bend, an achievement that may mark a major breakthrough in the search for strong, light structural compounds to withstand high temperatures has been reported.

Earl R. Parker, University of California metallurgist, said he and his colleagues have developed laboratory methods of treating some hopelessly brittle ceramic materials so they can be bent through large angles without breakage. Magnesium oxide is the most "bendable" ceramic they have found as yet.

The metallurgist reported his work in delivering the Campbell memorial lecture of the American Society of Metals at the Second World Metallurgical Congress meeting in Chicago.

Mr. Parker's work has been directed at combining desirable properties of both metals and ceramics. Ceramics are not affected by temperatures in the region of 3,000 degrees Fahrenheit, but they are very brittle. Metals have flexibility, but they become useless usually at about 1,700 degrees.

Noting the need in rockets, atomic energy and other fields, Mr. Parker stated, "it appears, on the basis of our research, that there is an excellent chance that a number of useful ductile ceramic materials will be developed within the next few years to satisfy the urgent demands of Government and industry."

Mr. Parker said greatly improved mechanical devices have been designed but remain unbuilt because of the lack of the right materials. He blamed an inadequate understanding of basic physical processes of materials for the lag in metallurgy.

Science News Letter, November 16, 1957

PALEONTOLOGY

Discover Skull Of Diprotodon

► A FARMER in the Darling Downs area of Southern Queensland, Australia, has discovered skull fragments of a Diprotodon, a huge marsupial animal that roamed the area less than a million years ago.

The farmer, W. H. Pearson, found the bones in a creek bed near his property. He has been collecting fossils on the Downs since 1912 and has made many important discoveries.

The Diprotodon, a huge harmless animal looking like a giant wombat, lived among the fresh water lakes of central Australia long before man began to record his own history.

He was a marsupial, 12 feet long, bigger than a rhinoceros. He had a blunt snout, was probably furry, walked on four stumpy legs, and may have traveled in herds, living on grass and leaves.

The director of the Queensland museum, George Mack, said the fossil pieces found by Mr. Pearson had been pieced together and identified as the back portion of a skull by Jack T. Woods, the museum's paleontologist.

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