

lations that the reaction should not occur at ordinary temperatures when only the gaseous substances are present. He therefore concludes that the reaction which commonly occurs must be accelerated by other substances present, either by solvents or by impurities in the two compounds, which are known as catalysts.

Catalysts or "parson chemicals" play extremely important roles in many industrial chemical processes, being key or trigger substances in hydrogenation, fixation of nitrogen and many other processes even though they do not partake in the reactions themselves. The theoretical pencil-and-paper work of Dr. Eyring therefore promises to illuminate some of the mysteries in this field of chemistry. Dr. Hugh S. Taylor, head of Princeton's chemistry department, has fitted Dr. Eyring's theoretical work into an extensive program of chemical exploration that is now in progress.

Dr. Eyring was born in Mexico of American parents and while an American by heritage and training he is finding it necessary to take legal steps to acquire American citizenship. He is married and has one child. Chemistry is his recreation as well as his vocation.

He was trained as a mining engineer at the University of Arizona, received his Ph. D. in chemistry in 1927 at the University of California, spent 1929-30 at the University of Berlin as National Research fellow, then returned to the University of California as an instructor under the famous Dr. G. N. Lewis. He has been research associate and assistant professor at Princeton since September, 1931.

Science News Letter, January 7, 1933

ANTHROPOLOGY

Man Had Toothache 50,000 Years Ago

MAN'S prehistoric ancestor, Neanderthal Man of 50,000 years ago, must have had toothache, too. Evidences of dental decay and impacted teeth dating that far back are described by Dr. Bernhard Wolf Weinberger, dentist of New York City.

The earliest dentists used some of the same materials, such as gold and silver, and some of the same type of instruments that are now used in dentistry. Pre-Inca Indians sought for means of preserving the individual tooth when it was diseased or decayed, while Old World dentists seem only to have been interested in supplying missing teeth.

Science News Letter, January 7, 1933

PHYSICS

Millikan and Compton Debate Cosmic Ray Facts and Theories

Leaders in Physics Agree About Most of Experiments But Uphold Different Theories Concerning Strange Radiation

TWO OF America's leading physicists, both Nobelists, discussed facts and theories about cosmic rays before the American Association for the Advancement of Science.

About most of the experimental facts they agreed. About the deductions from thousands of experiments performed by scores of investigators ranging the world, they largely disagreed.

Dr. Robert A. Millikan, of California Institute of Technology, upheld strongly as a fact his conclusion that the cosmic rays that enter the earth's atmosphere are photons, like X-rays and gamma radiations of the same family as light and heat.

Dr. A. H. Compton, of the University of Chicago, found "no way of reconciling the data with the hypothesis that any considerable portion of the cosmic rays consists of photons." He concludes that cosmic rays come from outer space as high speed electrified particles, either negatively charged electrons or positively charged protons.

As to what causes the discharging of the sensitive electrical instruments used in detecting the effects of cosmic radiation, Drs. Compton and Millikan agree. Very energetic electrified particles produce the effect, but whereas Dr. Compton considers them the original rays, Dr. Millikan advanced evidence that they are secondary radiation produced in the earth's air by photons smashing into the hearts of air atoms.

X-ray Similarity

To account for the very penetrating radiations that Dr. Millikan and others have observed in the depths of lakes, Dr. Compton countered with the suggestion that electron cosmic rays produce photons in the earth's atmosphere just as electrons striking an X-ray tube target produce X-rays.

His argument fell in line with experimental evidence for a new process of ionization presented to the same session by Dr. Gordon L. Locher, a Na-

tional Research fellow at the Bartol Research Foundation, near Philadelphia. X-rays are produced in the gas of a detecting chamber by the passage through of swiftly moving particles like electrons, according to Dr. Locher.

Reporting the results of airplane flights this past summer in the United States, Canada and Peru, at altitudes up to twenty-one thousand feet, Dr. Millikan explained that a new type, very sensitive, recording electroscope developed with Dr. H. Victor Neher showed differences in cosmic ray readings at high altitudes that may possibly be explained by a new cause, a modification of the earth's electrical field connected with some secondary influence of sunlight. Changes in the earth's negative electric field such as occur between day and night would change the resistance to the inflow of the secondary negative particles generated by the cosmic rays. But the rays that get down to sea level are so hard that the earth's electrical field would not affect them. This fits in with a lack of significant latitude variation in cosmic ray readings made at sea level by Dr. Millikan and others recently and in past years.

Magnetism Blamed

Dr. Compton and his associates in a world-wide survey during the past eighteen months found larger variations with latitude in cosmic ray intensities on the tops of high mountains. This he attributes to the effect of the magnetic field of the earth, since the earth's magnetism would theoretically keep electrified-particle cosmic rays from reaching the equatorial regions where the Compton experiments show cosmic rays to be less.

As to the energies of cosmic rays, there is difference of opinion. Dr. Millikan cited the experiments of his colleague, Dr. Carl D. Anderson, to show that observed cosmic ray energies lie largely below five hundred million volts and that less than a tenth reach the billion volt range. (Next Page)

Dr. Compton advanced an energy of seven billion volts for the electron cosmic rays that are so feeble as not to reach the equator, and he set thirty billion as the figure for a more penetrating component of high speed electrified particles. The high energy portion is not affected by the earth's magnetic field, Dr. Compton held.

As to the way in which cosmic ray effects vary with increase in height over the earth's surface, there is little difference in the experimental results, but both Dr. Millikan and Dr. Compton see the experiments bolstering up their theories.

The question of the origin of the cosmic rays, a moot question upon which there is little experimental evidence except the fact that they come from outer space, was left for future meetings.

Science News Letter, January 7, 1933

ASTRONOMY

Discovery Doubles Number Of Known Be-Type Stars

DISCOVERY of 236 stars in the northern Milky Way with layers of glowing hydrogen surrounding them was announced to the American Astronomical Society by Dr. Paul W. Merrill and Cora G. Burwell, of the Mt. Wilson Observatory.

These are known as type Be stars, and are especially interesting to astronomers because of some of their peculiar properties. The Mt. Wilson astronomers have been making a search for them, using the spectroscope to study the lines in the stars' spectra. As a result the total of known Be stars has been raised to 408.

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PLANT PHYSIOLOGY

Growth of Plants Stimulated By Proper X-Ray Treatment

X-RAYS can cause plants to grow faster, blossom earlier, form more chlorophyll, and in general speed up their life processes. But if they get too much of a dose of the rays, they become cripples.

This in brief summary is what Prof. Charles A. Shull of the University of Chicago has found in experiments which he reported before the meeting of the American Society of Plant Physiologists.

Prof. Shull exposed corn, wheat, oats and sunflowers to X-rays for periods of from one to five minutes inclusive, under screens to take out the harmful parts of the X-ray spectrum, and also for ten minutes without the benefit of screening. He compared the growth of these plants with "control" plants that were not X-rayed at all.

All the rayed plants except the ten-minute lot apparently were stimulated by the treatment. In some cases they became juicier, or more succulent, as well as larger. In corn a considerable increase of the green food-making substance, chlorophyll, was noted, running from 20 to 60 per cent. above the controls. X-rayed seeds carried on their respiratory processes with greater energy, the data indicating from 30 to 50 per cent. increase.

The three-minute treatment seemed to be most beneficial especially in the case of the sunflowers. Pots of the young plants ranged side by side mark off a curve with the graduated heights of

their tops: good at one minute, best at three, not so good at five, and disastrous for the ten-minute treatment without a screen. The plants were in bud at about the same time, but the three-minute group blossomed first.

The condition of the ten-minute group indicated emphatically the effects of too much of a good thing. It was badly burned, and pocked all over the leaves, as though with a mosaic disease. The leaves were irregularly lopsided, an effect not observed at all in the plants given shorter rayings under screens.

Science News Letter, January 7, 1933

VETERINARY MEDICINE

Conquest of Distemper May Protect Fur-Bearers

COMPLETE success in protecting dogs and other animals against distemper is claimed in the final report of "The Field" Distemper Council, of which the Duke of Portland is president, as the result of ten years' research in England.

A virus, a vaccine, and an anti-serum have been produced, and a healthy dog can be given lasting protection against distemper infection by the inoculation of vaccine followed a fortnight later by one of virus. If the anti-serum, used alone, is given sufficiently early in the disease, it will lessen the severity of an attack of distemper.

A survey of the results with the vaccine-virus method showed that, where exposure to infection was certain, the incidence of distemper among 650 foxhounds belonging to 23 hunting packs was only 1.4 per cent., and the death-rate 0.3 per cent. Without inoculation the incidence among young foxhounds in England is nearly 100 per cent., and the death-rate frequently 50, and sometimes more than 75 per cent.

As true distemper has recently been found to occur among fur-bearing animals related to the dog, such as the silver fox, or to the ferret, such as fitch, mink, and fisher, these methods will have immediate value where these animals are farmed.

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X-RAYS GIVE PLANTS "PROSPERITY CURVE"

Prof. Charles A. Shull of the University of Chicago gave sunflower seedlings varying doses of X-rays, and found that they stimulated growth. Figures on pots indicate number of minutes' raying. Ten minutes, unscreened, hurt the plants; shorter exposures helped.