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PAPERS AT THE CLEVELAND MEETING OF THE AMERICAN CHEMICAL SOCIETY

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ISOLATION of the heavy element proactinium has been achieved, according to an announcement made by Dr. Aristid Von Grosse, assistant professor of chemistry, University of Chicago, to the American Chemical Society meeting at Cleveland. Dr. Von Grosse stated that proactinium is the first chemical element to be isolated in the United States, although several elements, including illinium, alabamine and virginium, have been discovered here. The newly isolated proactinium is next to the heaviest element known, which is uranium with atomic number 92. Proactinium is number 91 and its atoms weigh 231 times as much as those of ordinary hydrogen. It is radioactive and continually breaks down like uranium and radium. Proactinium's half period, or the length of time it disintegrates to half the original amount, is 32,000 years. Radium is much shorter lived, having a half period of only 1,600 years. Of importance to scientists everywhere is the possibility that the famous super-heavy element number 93 of Professor Enrico Fermi, may be an isotope of proactinium. Personally, Dr. Von Grosse said, that he believed this to be the case and has so written to Professor Fermi. The work of isolating proactinium was begun three years ago, when three tons of radium residues were imported from the world's oldest radium factory at Joachimstal, Czechoslovakia. From a ton of these residues and at a cost of $5,000, Dr. Von Grosse obtained one tenth gram of proactinium in its pure form. A tiny sample of the rare substance was exhibited to the society. It is a thin coating of proactinium on tungsten wire and sealed in a glass bulb. A magnifying glass is needed to see it. Dr. Von Grosse, who is 29 years old, was born in Riga, Russia, and brought up in Shanghai, where his father was Russian Consul. He was educated in Berlin at the Institute of Technology, where he won the degree of doctor of chemical engineering in 1927.

A NEW tool for determining extremely minute amounts of chemical elements in microanalysis, using radioactive disintegration, was described by Dr. Charles Rosenblum, of the department of chemistry at the University of Minnesota. The new technique was acclaimed by the chemists gathered in Cleveland as having almost infinite possibilities in the chemical detection of amounts of material too small to be determined by the finest present-day chemical means. Describing his method, Dr. Rosenblum pointed out that many of the heavier elements have radioactive isotopes—twin forms which are chemically indistinguishable but which make known their presence by breaking down. Such isotopes liberate alpha, beta or gamma rays, just as the radioactive element radium does. All these rays can be detected by the methods of physics; hence the new microanalysis is a combination of chemistry and physics. The trick in the new method is to add to a solution of some element a small amount of a radioactive element with which it is isotopic. This mixture is chemically inseparable. Yet the amount of radioactive disintegration detectable is a measure of the concentration of the inert element. "If now a certain fraction, say half, of the inert element is removed from the solution by precipitation or electrodeposition," according to Dr. Rosenblum, "the same portion of the radioactive element is simultaneously removed. The radioelement therefore acts as an indicator of the inactive element." The usefulness of the method is not confined to the analysis of the heaviest elements. A determination of sodium sulfate concentration in very small amounts was possible. Using the method of radioactive indicators, the lessening concentration was traced both by radiometric and analytical measurements, but the former could do everything the orthodox methods did and much more. As another example, Dr. Rosenblum traced the solubility of lead sulfate in an alcohol-water solution. Dr. C. J. Brockman, associate professor, University of Georgia, chairman and organizer of the symposium on chemical indicators before which Dr. Rosenblum's paper was presented, said, "Dr. Rosenblum's method is a most powerful tool for the science of microchemical analysis. It is so much more sensitive than our common methods that I believe the possibilities for the future in this field are almost infinite."

A SUGGESTION that the changing enzyme content of various organs of the body during the development of a cancer tumor may represent defensive mechanisms of the body to prevent further malignant growth was advanced by Dr. E. F. Schroeder and Dr. Ellice McDonald, of the cancer research laboratories of the University of Pennsylvania. Future treatment of cancer may be directed toward methods of artificially stimulating the enzyme activity of an organ in order to aid this apparently natural defensive mechanism of the body. Speaking before the symposium on the chemistry of enzymes, the recent work carried out at the university on analyzing the enzyme content of cancer tumors and such organs of the body as the kidneys and liver was traced. Enzymes are the biological chemical catalysts which make possible chemical reactions without entering into the reactions themselves. The enzyme arginase occurs in large amounts in cancer tissue and appears to be closely associated with rapid growth processes like those found in necrotic tumors. The arginase content of other rapidly-growing tissues, like those of an embryo, also contain arginase and as growth slows down the arginase content decreases. In studies on rats given cancer by implantation, it was found that the faster a tumor grows, the more necrotic or degenerated it becomes and the higher grows its arginase content. At the same time the arginase normally present in the liver decreases as the tumor grows. For two other enzymes, cathepsin and phosphatase, the action works in a reverse sense. Their

content in a tumor diminishes as the cancerous growth becomes more necrotic. Phosphatase in particular seemed to be found in high concentration in the kidneys in rats resistant to cancer. The work suggests two pictures of enzyme cancer mechanism according to Dr. McDonald. In concluding the address he said: "The interesting question is raised as to whether these enzyme changes may not be related to a specific immunological reaction against the growth of cancer. For example, the high kidney phosphatase of resistant rats might act as a defensive mechanism against further growth of the tumor. Or, from another point of view, the implanted cancer tissue might liberate into the blood stream certain enzyme activators, or stimuli, which would cause other organs to respond by setting up a defensive mechanism in the form of increased enzyme activity. If the stimulus is sufficient the animal may throw off the cancer; if not, the cancer grows. This opens an interesting field in the possibility of artificially stimulating enzyme activity of an organ as a defense against further growth of the cancer."

NEW investigations in hypnotic drugs producing a degree of insensibility between normal sleep and complete surgical anesthesia were reported by Drs. E. H. Volwiler and D. L. Tabern, of the Abbott Laboratories, Chicago. Previous work with derivatives of barbituric acid has produced drugs of the neobutal type, now widely used in hospitals for patients before an operation and prior to the administration of a total anesthetic. Such drugs, when given by mouth in proper doses, produce a relaxed condition in the patient, without causing complete insensibility. While under their influence the patient could be given ether or other anesthetics, and could cooperate with the physician in the process. The desired insensibility came quickly and lasted only a little longer than the operative period; hence decreased possibilities of post-operative complications. Another major improvement in the barbiturate drugs was to increase the margin of safety between an effective dose causing insensibility and a fatal dose. Drs. Volwiler and Tabern observed that these specific effects of the barbiturates were associated with a certain arrangement of the atom groups within the molecules of the compounds. They determined to study the properties of other substances into which these groups might be incorporated. Substituted acetyl ureas, acetamides and brom analogs were employed. In all, twenty-seven different drugs were prepared. Some of these new preparations had unusually wide margins of safety. However, while their study may aid in increasing the knowledge of what factors are needed to raise the safety margin in hypnotic drugs, it is believed that the newest compounds described are not yet ready for clinical application.

A NEW means of speeding up tests by which tuberculosis may be determined was presented by Russell N. Loomie and Dr. Emil Bogen, of Olive View Sanatarium, Olive View, Calif. They pointed out that the remarkable light element, beryllium, possesses toxic properties not suggested by its chemical relationships. Their studies show that beryllium markedly accelerates the development of tuberculosis lesions in infected guinea-pigs. One way of detecting tuberculosis in man is to inject suspected sputum or other materials into guinea-pigs and await the development of tuberculosis in them. One hundredth of a gram of beryllium chloride injected weekly into guinea-pigs usually doubled the extent of tuberculosis found on dissecting the animals at death. Out of all the chemical elements obtainable for the work and after tests on thousands of guinea-pigs, beryllium was the only element which had this action. Tests showed beryllium did not affect the growth of the tubercle bacilli, nor was it found to increase the virulence of avirulent strains of tubercle bacilli such as BCG. It appears, however, to weaken guinea-pigs' resistance to the attack of the bacilli.

ONE of the strangest Jekyl-and-Hyde rôles among the atoms was reported by Dr. Walter H. Hartung, of the Sharp and Dohme Chemical Company of Philadelphia. The multi-faced substance is known chemically as propiophenone. Chemists know accurately its composition, or atomic "skeleton." It is a chemical having a pleasing odor that lends itself to blended perfumes. But by changing the kind of atom "flesh" through chemical manipulation, it is possible to produce thirteen different compounds, all active physiologically and representing seven different types of activity. From propiophenone two kinds of local anesthetics can be built up: a flavor suggesting licorice, a germicide eight times as powerful as carbolic acid, a chemical causing crying, and the stimulant ephedrine. Propiophenone rivals other organic chemicals reported which, while having the same basic atom skeleton, are found in such widely different things as cholesterol, vitamin D, the bile acids, the sex hormones and cancer-producing coal tar products. "While there is abundant evidence of relationship between physiological action and chemical constitution," according to Dr. Hartung, "our knowledge thereof is yet so elemental that we can not even yet vault the low hurdle raised by the chemical family descended from a simple substance like propiophenone."

THE "hot spot" of the world, so far as science can create it, is the carbon electric arc. Such arc lights, used in powerful searchlights, have a temperature of 3,810 degrees above absolute zero. This temperature is exceeded only in distant stars and in the center of the earth. The temperature of carbon arcs, after intensive research which began in 1801 with the work of Sir Humphrey Davy has been determined definitely. To have fixed the temperature as 3,810 degrees is an important landmark for science. Dr. V. C. Hamister, N. K. Chaney and S. W. Glass, of the National Carbon Company, indicated that the new-found temperature will be as important to the science of high temperatures as is the melting point of ice or the boiling point of water to investigators in ordinary temperature work. Uses of carbon arcs include: production of two billion candle-power beam for airway beacons, army and navy searchlights, light for motion picture projection and ultra-

violet light for irradiation of foods and milk to increase their vitamin D content.

As the wood of trees becomes really old—say about a million years, its cellulose content, which marks its youth, decreases while the proportion of lignin, telltale of old age, increases. This is shown in a study of chemical changes in glacial and pre-glacial trees by W. A. Gortner, of the University of Minnesota, one of the few undergraduate students on the highly technical program. Embedded in clay taken from a well ninety feet deep on what was once the site of the great glacial Lake Agassiz, Mr. Gortner found wood fibers buried during the five glacial invasions of ice which swept over the North American continent from 1,000,000 to 25,000 years ago. An examination showed that once vast forests of spruce spread over the region. Through the ages each forest in turn was covered by ice and glacial drift. Basing his experiments on the assumption that spruce wood to-day is like the spruce of a million years ago, Mr. Gortner, under the direction of Dr. S. I. Aronovsky, Dr. C. O. Rosendahl and Dr. R. A. Gortner, his father, made a chemical analysis of the various tree fibers. Cellulose decreased, he found, from 61 per cent. in modern spruce to six tenths of one per cent. in the oldest pre-glacial trees. Lignin, on the contrary, increased from its normal value of 30 per cent. to about 65 per cent. Cellulose, in effect, is what makes wood young. Mr. Gortner's paper is to receive the prize for undergraduate research offered by the Minnesota University Chapter of Sigma Xi.

The best lubricants allow motion between two pieces of metal when they act in the fashion of a small boy skating on ice. To reduce friction under conditions of high temperature and pressure a good lubricant should be a solid; but such a solid that it turns to a liquid when under a load. Dr. Robert C. Williams, of the Ironsides Company, reported that where high pressure and extreme temperatures occur the best lubricants are not the conveniently paste-like greases but solid wax-like materials. Such lubricants act very much as ice does under the runner of a skate; they turn to a liquid and then back to the solid form. Dr. Williams pointed out that one really skates on a film of water formed by the pressure of a skate runner. The water turns back to solid ice as soon as the pressure is removed. The physical properties of lubricants should be: (1) They should adhere firmly to at least one of the two surfaces between which the rubbing occurs; (2) they should remain in a solid form prior to the motion of the two parts; (3) they should turn quickly to a mobile liquid as soon as sliding under load occurs.

THE toxic, poisonous agent in poison ivy that makes it a scourge to picnickers and campers has at last been identified, according to Professor G. Albert Hill, of Wesleyan University. The harmful chemical in poison ivy that does the damage is called urushiol. It had been isolated years previously by the Japanese chemist Majima from Japanese lac. Some persons were poisoned by Japanese lac on Mah Jong sets imported during the "craze" several years ago. Professor Hill used 800 tons of poison ivy leaves in an effort to learn what the toxic agent was, but without success because of its complexity. Success came when the bark of the plant was used as the source of the poisonous urushiol.

DRS. C. D. LOWRY, JR., C. G. Dwyer, Gustav Egloff and J. C. Morrell, of the Universal Oil Products Company, reported that it is possible to use certain dyes as inhibitors for decreasing gasoline deterioration. With age the gasoline "guardians" weaken but at the same time their color fades. Thus chemists are able to tell when the inhibitory chemicals are so weak that they must be replaced.

ITEMS

AT 12:46 P. M., eastern standard time, on Sunday, September 23, the sun will be directly over the equator in its southward journey among the stars. This event, called the autumnal equinox, is taken by astronomical convention as the beginning of autumn. Because the sun is over the equator, it will rise directly in the east, and set directly in the west, so that it will be above the horizon just as long as it is below. Astronomers place no credence in the popular belief in a "line storm" occurring when the sun thus crosses the "line." September is apt to be a stormy month, but bad weather is no more likely to occur on September 23 than on the days before or after.

THE drought of 1934 is at last in full retreat; even the U. S. Weather Bureau has acknowledged the defeat of its late enemy, after a survey of another week's strong rains throughout most of the great central valley. In fact, in some places in Ohio the seeding of the winter wheat crop has been delayed by an excess of rain. Nevertheless, the mischief done by the long drought is far from being repaired, even when the last summer's crop losses are written off the books. Over large parts of the West the reserve of subsoil water is still far below normal. A winter of heavy snows would be one of the greatest benefits the western grain areas could receive.

RUSSIAN thistles, ordinarily regarded throughout the West as a nuisance of a tumbleweed, will yield hay or silage serviceable enough for emergency purposes, according to Professor F. W. Christensen, specialist in animal nutrition at the North Dakota Experiment Station. To be useful for feed, the thistles must be cut while they are in bloom, before the sharp, troublesome spines form and harden. The thistles must be regarded as an emergency ration only, not as a substitute for the regular cultivated hay or silage plants.

WAR against chinch-bugs must be waged on a wider front and more intensively in 1935 than it was last summer, unless severe weather in fall and winter decimates the hordes of the pests now settling into winter quarters in weedy fence-corners and along grassy roadsides. A survey of the situation by the Bureau of Entomology, U. S. Department of Agriculture, gives indication that Iowa will have an especially severe chinch-bug problem to cope with next year. Normally, only the southern fringe of that state is invaded by the insects, but during the past summer they got well up into the central counties; and the territory they have gained will serve for next summer's "jump-off."