SUNLIGHT UTILIZED IN FOOD INDUSTRY

Members of Chemical Section Hear Dr. Sheppard on Photochemistry

NEED SHORTER WAVES

Progress in the direct utilization of sunlight in the chemical synthesis of foodstuffs was reported, yesterday afternoon, by Dr. S. E. Sheppard, research chemist of the Eastman Kodak Co., in an address to the chemical section of the American Association for the Advancement of Science.

"Signs are not lacking," said Dr. Sheppard, "that the interest of investigators in photochemistry is on the increase." This is due to the recent technical development of powerful sources of ultra-violet light, such as mercury vapor arcs in fused quartz, white flame carbon arcs, and condensed spark discharges.

The efficiencies of many commercially promising processes are being studied, to determine the amount of product per unit of radiation absorbed, and Einstein's law of photochemical equivalence seems to hold well when the process is not masked by side reactions.

Short Wave Length Needed

In most reactions, however, a great role is played by catalysts, such as the green leaf-stuff of plants, which by its mere presence seems to make the light energy available for the chemical uses of the plant. The action of these catalysts, said Dr. Sheppard, seems to be similar to that of the dyes with which photographic plates are sensitized for visible and infra-red rays. That is, the catalyst, or sensitizing agent, is able to absorb energy of one wave-length and turn it over to the reactive system at another wave-length, in a form in which it can be utilized to bring about chemical change.

It thus appears to be one of the outstanding commercial problems of the future to find suitable photochemical catalysts for industrial chemical processes. Many of these processes need light of very short wave length, while in sunlight we have an abundance of longer wave length light.

The chlorophyll of plants is the ideal type of these catalysts, and while no one has yet found any others which work as well in light of low intensity, it seems quite possible that better ones can be found for work at high light intensities. The synthesis of formaldehyde, and even of sugars, has been effected by photochemical means, and Dr. Sheppard indicated that some such process may in the near future prove commercially attractive.

DAVIS LECTURES ON THE GRAND CANYON

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lowlands; for the two heavy series of strata above mentioned are each seen to rest upon lowlands of erosion. One of these lowlands now slants to the east as the result of an ancient deformation of the region which tilted both the lowland of erosion and the heavy cover of strata which was afterward deposited upon it. The other lowland of erosion is still horizontal, as it must have been when it was worn down, but it is now covered by a second series of strata which constitute the plateau through which the canyon is now eroded. The long chapters of past time recorded by these alternations of vast erosions and vast depositions were all receded by a still longer chapter of time in which the complex fundamental rocks, seen in the inner and basal gorge of the canyon, were formed. Hence, instead of regarding the erosion of the present canyon as having occupied a large share of the past history of the earth, we may now regard it more properly as representing only the valiant opening of a new chapter of erosion, which was not begun until five long antecedent chapters had been completed.

Canyon Follows No Fracture

"But the mistake must not be made of thinking that those five long chapters of past time and the shorter supplement of the canyon cutting represent the whole volume of the earth's history, the whole age of the earth. That would be as serious a mistake as to accept the duration of the last five sheepskin coats that Methuselah wore as representing all the years he lived. He must have worn out scores and scores of coats before his last five. Similarly, before the five long chapters of earth history recorded in the walls of the Colorado canyon, during all of which the earth had essentially its present size, ages and ages must have elapsed while the earth was growing to its diameter of nearly 8000 miles. Hence, the study of the canyon, and of the earth generally, reveals no creation, but only a long sequence of changes, an evolution. But of all parts of the earth, there is no other in which the later chapters of its evolution are revealed with such striking clearness as in the Colorado canyon walls."

Giving at the beginning of his lecture the evidence of the erosional origin of the canyon, Professor Davis said, "Most visitors to the Colorado canyon—and visitors are now numbered by many thousand every year—when they learn that the canyon has been eroded by the ordinary processes of weathering and washing now in operation, instead of having been suddenly opened by a convulsion of nature, marvel at the time that must have been required for its slow excavation; and some even question whether the earth can be so ancient as to have permitted the production of so vast a chasm by the gradual work of the river and its tributaries. Yet," he said, "there can be no question of its gradual production. In the first place, it does not follow a fracture in the earth's crust; not that no such fractures exist, but that such as do exist in northern Arizona run north and south, while the general course of the canyon is from east to west. In the second place, the canyon has not in the least the form of a fracture, which should exhibit vertical and parallel walls; the sides of the canyon are rarely vertical but yawn so widely open that where it has a depth of a mile it has a top width of from ten to fourteen miles.

Is Work of Matter and Water

"Moreover the canyon walls are everywhere interrupted by side canyons, short and long, and of precisely such form as would result from the erosive action of the wet-weather side-streams if they had been at work to cut down their courses while the main river was at work to cut down the main canyon; and the side canyons, like the main canyon, have yawning walls, the natural result of the wasting of their rocks under the attack of the weather. The canyon is unquestionably the work of matter and water."

HORTICULTURAL SOCIETY HEARS PROF. RADSPINNER

Professor W. A. Radspinner of Stillwater, Oklahoma, speaking before the American Society for Horticultural Science, yesterday told of an investigation which he made last summer of the causes of blossom drop of tomatoes, a disease which is prevalent and destructive in Oklahoma and neighboring states, and sometimes causes a loss of 100% of the tomato crop during midsummer in Oklahoma.

The results of Professor Radspinner's experiment showed that low atmospheric humidity, high temperature, and a limited moisture supply often lead to the dropping of blossoms. They showed also that immature tomato blossoms drop owing to physiological rather than to genetic or pollination causes; that water deficits in the soil play a part; that extremely high temperatures and low humidity caused the blossoms to drop, probably by increasing transpiration rates; and that fertility of the soil had only minor effects on the dropping of blossoms.

BRIDGE GAP BETWEEN LONG AND SHORT WAVES

Light, Heat and Electric Waves Are Shown of Similar Nature

Physicists have finally succeeded in bridging the gap between the electric wave and heat wave spectra by obtaining electric waves as short as the longest heat waves, and by detecting heat waves with electric wave receivers.

Dr. E. F. Nichols, director of Pure Science at the Nela Research Laboratories at Cleveland, and former President of Technology, and Dr. J. D. Tear, Assistant Physicist at the same laboratories, announced in a paper presented to the American Physical Society, yesterday, that by the aid of newly designed and more sensitive instruments and improved methods of experimentation they have succeeded in generating, receiving and measuring electric waves half a millimeter or one-fiftieth of an inch in length. For comparison the ordinary radio transmission is by electric waves of the order of half a mile long.

Wave Emission Polarized

As a latest proof of the identical character of light, heat, and electric waves Dr. Nichols and Dr. Tear have succeeded in using two different types of electric wave receivers to detect and remeasure Rubens' and Von Baeyer's long heat waves.

As a by-product of the investigation, the long wave emission from the quartz mercury arc has been found partially polarized, a fact which throws new light on the activity of the ions which emit this long wave radiation. Dr. Nichols and Dr. Tear have also found that the radiation can be isolated from the complex total emission of the mercury arc by simply sifting it through two thicknesses of black paper, thus avoiding the elaborate focal isolation method and apparatus previously thought necessary to accomplish this separation.

LIDDELL DESCRIBES PREHISTORIC SPEECH

Addresses Anthropologists on Language Analysis

Mr. Mark H. Liddell, Professor of English at Purdue University, speaking before the American Anthropological Association, yesterday, proposed that the sciences of anthropology and linguistics should be brought into closer touch, by following out to their legitimate conclusions some of the results of recent investigations in the field of acoustic physics, which, he indicated, have made it possible to learn what are the fundamental qualities of speech sound, which condition all language.

Professor Liddell spoke especially of inventions and appliances for accurate sound analysis recently developed by the research department of the American Telephone and Telegraph Co., and put at his disposal for experimental work. He expressed the hope that studies of speech made with such instruments would furnish us with a simple theory of the origin of language which would accord with what we now know of the history of primitive man.

To Gain Primitive Speech Conceptions

"In closing," said Prof. Liddell, "I would suggest, therefore, as a preliminary effort, to determine anthropologically the nature of man's primitive speech, an especially careful measurement of the remains of the human resonance organs as they appear in the palatal arches and nose cavities of prehistoric skulls. For the time may come when the physicist with such data at hand can reconstruct the types of resonance that such remains of resonance chambers would give out when the skill of the anatomist had been invoked to supply the missing parts. Of course this does not mean that we shall ever be able to reconstruct primitive spech; but we may at least gain some definite scientific conceptions of its elements."

DR. MERRILL SPEAKS ON BEE PROTECTION

Dr. J. H. Merrill, Associate Professor of Agriculture at Kansas State Agricultural College, told the apiary section of the American Association of Economic Entomologists last evening, of experiments on the value of winter protection for bees, showing exactly how much advantage could be derived from the use of a windbreak.

Six hives containing a known amount of honey and a known number of bees, were placed on scales, and daily readings were taken of all changes in weight. Three of these hives were sheltered by a windbreak, while the others were not. It was shown that the windbreak made an average difference of 8600 bees in a one-story unpacked hive, 7968 in a two-story unpacked hive, and 3539 in a packed hive. It was indicated that if a windbreak is not available, added packing will to a certain extent offset this disadvantage.

PROF. UHL ANALYZES READING STANDARDS

The recent attacks upon the content of courses in reading and literature for elementary and high schools make it advisable to examine the standards by which this content has been selected, and to set up new standards if the old are inadequate. This was the contention of Professor W. L. Uhl, of the Education Department of the University of Wisconsin, speaking before The Education Section of the American Association for the Advancement of Science yesterday morning.

Professor Uhl described his recent attempt to derive new and more adequate standards than those of the past by securing data from over three thousand school teachers and over one thousand school children. These passed judgments, and gave their reasons, on more than seven thousand reading selections and books.

Standards Analyzed

Professor Uhl said that the teachers reported three main objectives of courses in reading and literature, namely: the mastery of the mechanics of reading; comprehension and interpretation of what is read; and the development of literary culture. It is in reference to these objectives that nearly all of the teachers and pupils made their estimates.

"The determination of standards," concluded Professor Uhl, "then becomes a matter of finding desirable or undesirable content, analyzing this content whether good or bad, studying the comments of teachers and pupils on the content, and finding out the grades in which certain content can be used with optimal benefit. In carrying out this determination of standards, typical desirable and undesirable content are analyzed and discussed with reference to the comments of the persons who use the content in schools."