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THE ATLANTA MEETING OF THE AMERICAN CHEMICAL SOCIETY

THE South has profited immensely by the assistance of chemistry in industry, and it has thereby contracted a debt to the science which it can pay only by whole-hearted encouragement and generous support of chemical education and research. This was the thesis of an address to the people of Atlanta given on April 3 by Dr. Harrison E. Howe, editor of *Industrial and Engineering Chemistry.* Dr. Howe has just finished an 11,000-mile survey tour, during which he visited numerous industrial plants, educational institutions and research laboratories where chemistry plays an important part in the program. He is convinced that now is the time when chemistry should be most strongly encouraged, not only for the speedier ending of the present industrial sag but for the upbuilding of the greater era of prosperity which is to follow. Dr. Howe pointed out that encouragement of chemistry does not imply merely the support of such branches of the science as promise immediate application. The employment of plant chemists and chemical engineers is now recognized as an integral part of good industrial management. What is more needed is a far-sighted and public-spirited program of development in chemical research institutions and chemical departments of universities, with adequate, continuous support of fundamental work too often considered "merely theoretical" by those who should supply needed resources. All sound practice is based on sound theory, and there can not be advance in practice unless advance in theory pioneers the way for it. Much of this fundamental work that will pave the way for further industrial advances should be done in the South according to Dr. Howe. Irrespective of where competent chemists are trained, the laboratories where they will work will inevitably be more or less in the shadow of the interests and problems of the regions where they are located. It is therefore properly enlightened self-interest, as well as proper local patriotism, for Southern communities to bring up their own chemists in their own chemical laboratories.

THE meeting of the American Chemical Society opened on April 8 with a symposium on analytical chemistry, participated in by Professor H. H. Willard, of the University of Michigan; Professor George L. Clark, of the University of Illinois; C. C. Nitchie, of Palmerton, Pennsylvania; Dr. C. W. Mason, of Cornell University; Professor Victor K. LaMer, of Columbia University, and Professor Harry B. Weiser, of the Rice Institute. The old-time apparatus of analysis has not been abolished by any means, but rather improved in pattern and made of better materials. The chemist's glassware shelf now boasts a goodly proportion of pyrex and fused quartz wares, which are less soluble in strong reagents than glass, once the only material available. There are better filters and improved controls over temperature, humidity and other factors that influence the outcome of experiments. Where the older chemist needed whole ounces of material before he could make an analysis, his modern descendant can often get even more accurate results with a speck of stuff no bigger than a pinhead. He puts the material to be analyzed under a microscope instead of into a test-tube, and through the magic eye of that instrument sees the effects of the reagents he applies multiplied a thousand-fold. Watching rainbows used to be the most visionary of occupations, but the modern chemist, watching through his spectroscope the glowing streaks given off by an ignited "unknown," can dissect its chemical makeup as accurately as the anatomist with his scalpel can take apart a fish or frog. Beginnings in spectrum analysis were made long ago, but these were only qualitative: they told what was in a given sample of material, but did not answer the question, "how much?" which is basic to all industrial processes as well as to a great deal of "pure" chemistry. Now the magic rainbow-tube of the chemist is beginning to be able to weigh the parts of the things it is called upon to analyze.

CHANGING one chemical element into another by the action of a third element and in the process obtaining two still different elements is the atomic juggling described by Dr. William D. Harkins, of the University of Chicago, and Dr. Arthur E. Schuh, of the Bell Telephone Laboratories. The experimenters were not able to obtain changed elements in any useful quantities, but have been working with single atoms, observed by the indirect process of watching the cloud of fog they leave behind them as they dash through a chamber containing water vapor at low pressure. Nitrogen, the element that makes up some three-quarters of the air we breathe, was what they started out with. It was bombarded with alpha particles—nuclei of helium atoms given off by thorium, an element like radium, while disintegrating into another element. There is no way of aiming the atomic bullets, but after a long enough series of trials, an occasional hit may be scored. Dr. Harkins and his associate studied nearly half a million tracks of atoms, and only found two that showed evidence of a disintegration of the atoms into another element. Here is the complicated series of events they believe to take place in the instant of time that the change requires: The alpha particle, or helium nucleus, attaches itself to the nucleus of the nitrogen atom. It thus becomes the nucleus of an atom of fluorine. In less than a millionth of a second, however, the fluorine nucleus emits a fast hydrogen particle, or proton, part of the atomic nucleus. The remaining part is the nucleus of an oxygen atom of mass 17. Ordinary oxygen has an atomic weight of 16, but it has a variant, or "isotope" of atomic weight 17.

THE chemical riddle of the common cane or beet sugar has been solved by a research worker in the U. S. Hygienic Laboratory at Washington, Dr. C. S. Hudson, who told how the cane sugar molecule—called "sucrose" by chemists—is put together. It has long been known that the sucrose molecule is made up of 12 atoms of carbon, 22 atoms of hydrogen and 11 atoms of oxygen, expressed in the formula: $C_{12}H_{22}O_{11}$. But how these 45 chemical building-blocks were arranged nobody knew; and the possible combination of 45 atoms in space, even with the limits imposed by chemical laws, made it not much use guessing. Dr. Hudson preferred not to guess. He experimented. The first step was the discovery that under certain chemical manipulation sucrose breaks down, yielding two other common sugars. One of these is dextrose or glucose, which is now made by millions of pounds from cornstarch. It is not so sweet as sucrose. The other product of the breakdown is levulose or fructose, much sweeter than sucrose. This sugar has been produced on a large-scale experimental basis. The problem remained as to how these two sugars, whose structures were already fairly well known, were arranged in their modified combined form in cane sugar. This is the accomplishment reported by Dr. Hudson.

THERE is radium in Stone Mountain, the famous dome-shaped mass of granite near Atlanta that has been chosen as the site of a titanic monument to the heroes of the Confederacy. If it could all be extracted, it would be worth over 120 million dollars. But it will never be extracted, for in spite of its value in the mass, the rock constitutes too low-grade an ore to be worth working. What can be extracted from Stone Mountain, however, is scientific information worth eventually many times the fabulous 120 millions. When its geochemical secrets are fully read and compared with readings yielded by other stones, scientists will know much more about the age of the earth than they do now, and more about where the interior energy comes from that helps to keep the earth warm, and maintains a layer of melted rock some miles beneath the surface, between the solid crust above and the solid core below. A few preliminary paragraphs of the story which Stone Mountain may be expected to tell were related before the society by Dr. Charles S. Piggot, of the Carnegie Institution of Washington. His first analyses of the granite of the mountain show that it contains from four to eight times as much radium as granites and other rocks obtained from a number of other widely separated places, ranging from North Carolina to Greenland. At that, it contains very little. One gram, or about one-thirtieth of an ounce, of the rock has less than one four trillionth of a gram of radium in it. Only one other rock sample contained approximately the same concentration of radium. This came from North Jay, Maine, from a formation believed to be similar in its origin to Stone Mountain. Stone Mountain is made out of granite formed into a mass deep under the earth, which was afterward slowly eroded away from it, exposing it above the surface. Such a mass is known to geologists as a "batholith." Whether all batholithic rock will show a high concentration of radium, as compared with the low concentrations which Dr. Piggot found in his other rocks, all of which came from nearer the surface, is still a matter for speculation.

PROFESSOR ARTHUR F. BENTON and T. A. White, of the University of Virginia, reported on some new things they have learned about the way catalysts act, especially at very low temperatures. They worked with finely divided nickel, which is one of the most widely used of catalysts, and hydrogen, one of the commonest of industrial gases, at temperatures ranging as low as 220 degrees below zero Centigrade. The volumes of the gas adsorbed to the nickel under the conditions of the experiment led the chemists to the conclusion that adsorption takes place in two stages. In the primary stage the metal sheathes itself in a layer of gas molecules to the thickness of one molecule. When this envelope is complete, the gas molecules are more highly "activated," that is, more ready to combine into new compounds, than at any other time. Before the layer is complete, the catalyst may attract and hold patches of gas molecules, but they are too tightly held to be available for combination purposes. After the layer is complete, other secondary layers may form outside it, but these appear to be less under the influence of the catalyst and are therefore more indifferent to opportunities for forming combinations.

A NEW gas for the coils of electric refrigerators was demonstrated. It is non-poisonous and non-inflammable, and it very closely approaches the refrigerating engineer's notion of an ideal substance for the purpose. The new gas is a compound of carbon, chlorine and fluorine, and is a chemical cousin to carbon tetrachloride, widely sold under a variety of trade names and used for such diverse purposes as grease-spot remover, fire extinguisher and insect exterminator. As a matter of fact, carbon tetrachloride is one of the two ingredients that are used in making it, the other being a less-known compound, antimony fluoride. The new refrigerant is the invention of Thomas Midgley, Jr., the developer of ethyl gasoline, and a Belgian chemist, Dr. A. L. Henne. The work was done in the laboratory of one of the large electric refrigerator companies at Dayton, Ohio. The new gas is as completely non-toxic as carbon dioxide. Animals kept in an atmosphere containing a considerable percentage of the new refrigerant showed no signs of distress or illness. It is also completely non-inflammable.

THE largest nitrogen fixation plant in the western hemisphere, which greatly increases the industrial and military independence of the United States, was described by Professor Lauren B. Hitchcock, of the University of Virginia. This plant converts daily 350 tons of inert nitrogen gas of the atmosphere into sodium nitrate and anhydrous ammonia for peace-time industrial uses. But if the United States were at war, the plant would largely free her of the necessity of getting Chile saltpeter from South America for fertilizer, explosives and essential chemical industries. The plant is a splendid example of the application of recent refinements in process, the speaker said. Application of the latest technology is necessary in order that the synthetic material may compete with the Chile product dug from the surface of the ground. It is situated at Hopewell, Virginia, on the James River, eighty miles from Hampton Roads.

PLANS of the U. S. Bureau of Mines to assist American industry in getting the best value out of every dollar's worth of coal were laid before the society by Dr. A. C. Fieldner and J. D. Davis, of the Bureau of Mines staff. The time is long since past when all you could do with coal was burn it. All coals susceptible to the coking process are baked now before they are burned, and valuable liquids and gaseous ingredients are extracted from them. But coking coals from different mines have different properties, and a temperature or time of treatment good for one kind might be bad for the next. For this reason a systematic survey is being made of all the coking coals in the country, so that complete data may be available for any one who may be able to make use of it.

RESEARCH has made possible the production of a large portion of the annual turpentine and rosin yield in the southeastern states from pine stumps instead of full-grown trees, according to Brian S. Brown, of Savannah, Georgia. Early methods practiced until the beginning of the present century were fatal to trees. Then the external cup to catch the gum replaced the internal cut. Now improved methods of chipping trees, increasing fire protection and rapid growth of slash pine insure practically unlimited future supplies of rosin and turpentine.

GOOD food for human beings will come from parts of cotton seed now fed to cattle and hogs, or even wasted. So predicted a New York chemist, David Wesson. "A cotton crop of fifteen million bales furnishes the oil mills with five million tons of seed. This seed produces, under present methods of manufacture, 308 pounds of oil per ton of seed, or 13 pounds of fat for each inhabitant of the United States. Improving manufacturing methods would yield 20 per cent. more oil and allow the utilization of the 900,000 tons of protein present in the seed for human food, supplying approximately one half the protein needs of the country. Experiments made on a semi-commercial scale show that these results are possible."

SALMON oil, now looked upon as a fisheries by-product of no great value, is a good source of the rickets-preventing vitamin D, now considered essential for the raising of chicks and other young animals as well as for the proper rearing of children, according to E. M. Nelson, of the U. S. Department of Agriculture, and J. R. Manning, of the U. S. Department of Commerce. A number of oils from commercially handled fishes were tried out, and it was discovered that salmon oil, though not the most abundantly produced of these, is nearest to cod-liver oil in its vitamin D concentration. As extracted by the present methods, which are not especially good from the vitamin standpoint, salmon oil is about equal in potency to the poorer medicinal grades of cod-liver oil. Since the potential supply of salmon oil is five times as great as the present domestic supply of cod-liver oil, these findings are regarded as significant.

THAT there can be too much of a good thing has been demonstrated anew by a New York biochemist, R. F. Light. He fed to experimental animals heavy overdoses of vitamin D, the substance that prevents rickets. In this overdosage it carried its preventive activities too far, making it impossible for the animals to reproduce their species after the second generation. Other studies in vitamin overdosing were carried out by Mr. Light in collaboration with G. E. Miller and C. N. Frey. In these it was found, among other things, that too much vitamin D produces a condition resembling pellagra, which could be delayed, though not prevented, by the administration of vitamin G, the pellagra preventive vitamin.

GLOSSINESS of paints can now be measured without regard to their color, with a new instrument described to the paint and varnish chemists at Atlanta by George S. Haslam and Lester D. Grady, Jr., of Palmerton, Pennsylvania, who stated that "The value of the glossmeter lies in its ability to give a result that is independent of the color and brightness of the sample and in giving a numerical value for gloss so that the loss of gloss on aging can be followed."

ALTHOUGH the manufacture of artificial silk and wool has increased enormously during recent years, the production of the synthetic fibers in 1929 was less than four per cent. that of the natural fibers according to Professor Charles E. Mullin, of Clemson College. He also predicted that the 1930 output of synthetic yarns will exceed the million and a quarter pounds of last year by more than 30 per cent., and he added that the saturation point to-day is as far off as it was 10 years ago. Chemical research was cited as being largely responsible for developing the new processes of manufacture and then opening up new uses and outlets for the products. "As compared to the wonderful progress in this industry, the rest of the textile industry has been standing still, rooted in its own ignorance of the fundamentals involved in every step in all its manufacturing processes."

SOME of the principles of distillation were known in ancient times, and in the heyday of the alchemists, during the sixteenth and seventeenth centuries, these ancestors of the modern chemist knew almost all of the tricks in the trade. So Gustav Egloff and C. D. Lowry, Jr., of Chicago, pointed out before the chemical education section. The alchemists did not waste all their time hunting for such fabulous things as the philosopher's stone. They were a practical lot of artists, though their scientific knowledge was sketchy in some departments, and they used apparatus that often had a decidedly modern look for the distilling of all manner of objects, including wood, ores, aqueous and spirituous liquids, flowers and herbs.

EUROPE was not the only region of the earth where alchemists plied their secretive trade and marketed their often spurious discoveries. In China, too, this half-disreputable ancestor of chemistry reared its head, so long before European alchemy came into being that Chinese alchemy may well be the ancestor of all the Occidental alchemies. So the division of the history of chemistry of the American Chemical Society was told by Professor Tenney L. Davis and Lu-Ch'iang Wu. Alchemy seems to have arisen spontaneously in China, where it was certainly in existence as early as the second century B. C. The Chinese alchemists attempted to transmute base metals into gold and to prepare the elixir of immortality. They worked with the same materials that were used by the later Greek, Arab and European alchemists.