SCIENCE NEWS

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NEW SYNTHETIC RUBBER

THE impending commercial production of rubber by E. I. du Pont de Nemours and Company, at a New Jersey plant, using coal, limestone, salt and water as raw materials, recalls the frantic and partially successful efforts of Germany's chemists to make synthetic rubber during the war. Cut off by the blockade from the plantations, Germany perfected a very similar process to that recently devised in Wilmington, Delaware, by the du Pont chemists, Mr. F. B. Downing, Dr. W. H. Carothers and Mr. Ira Williams. But cost was no barrier to the Germans when crude natural rubber was unobtainable, whereas the new American synthetic product, claimed to be in some respects superior, will have to compete with nature's efforts at six cents a pound.

Dr. A. von Weinberg, of the German dye trust, predicted in 1928 that synthetic rubber "would soon appear on the world markets as a commercial commodity, equal to natural rubber and cheaper in cost." The world is still waiting for the fulfilment of this prediction.

Fifteen years before this, just before the world war, the eighth International Congress of Applied Chemistry in New York City was enlivened by an acrimonious discussion between Professor W. H. Perkin, of Manchester, England, and Dr. Carl Duisberg, of Leverkusen, Germany. The English chemist claimed that he and his assistants had succeeded in producing rubber from potato starch and that they could repeat their laboratory success on a commercial scale. This the German capped by exhibiting a pair of automobile tires which had run a thousand miles and which were made of synthetic rubber.

Numerous patents have been taken out in the last twenty years for the artificial synthesis of rubber. All these patents cover two separate stages, the formation of a liquid hydrocarbon like "isoprene," obtained when rubber is distilled in the absence of air, and processes for coaxing the isoprene or similar molecules to condense with one another to form a rubber-like network. The second process, known to the chemist as polymerization, was first carried out by a French chemist, Bouchardat, as long ago as 1882 and has been repeated in many other ways since then.

In both the German war process and the du Pont process the first stage begins with production of the gas, acetylene, from calcium carbide by adding water. The acetylene is then combined with hydrogen and condensed to form a liquid called vinylacetylene closely related to isoprene, and that in turn is condensed to form chloroprene and then rubber.

The new du Pont product is claimed as superior to natural rubber in that it vulcanizes or hardens without the addition of sulphur, does not swell noticeably in gasoline and can be made to form a liquid similar to the tree latex, but superior in its ability to penetrate porous materials. A similar x-ray structure to natural rubber is found in the new rubber.

Isoprene is most easily made from turpentine, which it resembles chemically, but with turpentine costing about five cents a pound this is not practicable. It can also be obtained as one of the products of the Bergius process for liquefying coal. Kansas corn was proposed in 1925 by Professor James F. Norris, of the Massachusetts Institute of Technology, as a source of an isoprene substitute, methylbutadiene. In fermenting corn to form butyl alcohol, acetone is obtained as a by-product. The isoprene substitute is easily obtained from this.

Dozens of different other methods have been devised for each of the various steps of the synthesis. Numerous "synthetic rubbers" resembling the natural product in more or less degree have been made by these methods from time to time, but none has survived the test of price, as has the chemist's artificial indigo.

THE BENDIEN CANCER TEST

THE Bendien test for cancer, which was devised by Dr. S. G. T. Bendien, of Zeist, Holland, is still being investigated by leading British laboratories in the hope that a reliable method of early diagnosis may be available to the medical profession, although Sir C. Gordon-Watson, chairman of the investigation committee of the British Empire Cancer Campaign, has just poured cold water on these hopes. The test is not at present being applied clinically, and the scientists working on it stress particularly the fact that it is not in any sense a cure or a treatment of cancer.

Sir Gordon-Watson's opinion is that "although the preliminary results were encouraging, subsequent inquiries have failed to justify the early promise, and Bendien's method of diagnosis for malignant disease can not at the present time be accepted as reliable." All hope is not lost, however, and Dr. Alfred Piney, of the London Cancer Hospital, is continuing his investigation of the method.

When Dr. Bendien's test came to the attention of British medical authorities, the British Empire Cancer Campaign sent Dr. Piney, its secretary, to investigate. He carried 38 tubes of blood. Among them were bloods of many ailing patients, some suffering from diabetes, some from rheumatism, and a few from cancer. A few tubes contained the blood of healthy normal people. Dr. Bendien tested these blood-serum samples and when his findings were compared with the sealed diagnoses of the physician who collected the blood samples, they were found to correspond in every instance where cancer was involved.

Dr. Bendien's test consists of two parts, one chemical and the other spectroscopic. In the chemical test twenty tubes containing equal amounts of serum are treated with sodium vanadate in acetic acid solution of varying strength and hydrogen-ion concentration, and the turbidity or flocculation produced is carefully noted. With normal serum the flocculation begins in the sixth tube.

With serum from patients suffering from cancer, tuberculosis and one or two other diseases, flocculation takes place in earlier tubes. To distinguish between those ailments, Dr. Bendien dissolves the precipitate from the chemical test in a 2 per cent. sodium bicarbonate solution and measures, by means of a spectrograph, its power to absorb ultra-violet light. It is stated that this "absorption spectrum" differs, according to the type of ailment, and Dr. Bendien claims that he can in this way distinguish cancer from the other diseases which behave in the same manner towards the chemical test.

Others have been investigating the test besides Dr. Piney. At the County Laboratory, Stafford, Dr. J. Fine has found that the chemical test gives good results. The spectroscopic part of the test seems to be much less reliable and involves the use of expensive optical instruments. Prior to Sir Gordon-Watson's statement the opinion of independent investigators on the whole has been that the test is far from infallible, but may be a step in the right direction.

VITAMIN ADVERTISING

HALF-TRUTHS in the advertising of vitamin content of foods are very likely to mislead the public, Professor H. C. Sherman, of Columbia University, authority on vitamins, warned in an address before the meeting of the Association of Official Agricultural Chemists held recently in Washington, D. C.

So-called "vitamin-rich" foods, said Professor Sherman, may actually be grossly lacking in the vitamins A, C and G, which are necessary in maintaining a buoyant state of health, though containing enough of vitamins B, E and D. Official chemists, he said, must tackle the problem of measuring the amount of each and all of these six or more chemically different substances in foodstuffs if they are to guard properly the nation's food supply. Commercial irradiation of foods with ultra-violet light, so widely advertised, increases only the vitamin D amount, and is where "we are most likely to meet the problem of what constitutes proper advertising of vitamin value in food," according to Professor Sherman.

Milk to which irradiated yeast rich in vitamin D has been added, he said, may properly be advertised as superior in its vitamin value, as milk itself is at all times a good source of all the other known vitamins. But this is not true of a food which is deficient in several of the vitamins.

Enough of a vitamin merely to prevent disease, Professor Sherman continued, is not a satisfactory standard for the American people. "We must conclude that of vitamins A, C and G we need, in order to do our best, amounts several fold larger than are needed to prevent the characteristic signs of deficiency or even to support fully normal growth. We want our people to have not merely enough to escape actual deficiency, but enough to enable them to do their best."

Hidden substitutes for milk or egg fat in manufactured food and imitation fruit juices were among the preparations mentioned by Dr. Sherman as preventing the attainment of optimum vitamin content in the American diet. The optimal amount is far above the minimal amount.

THE DEATH-RATE FOR 1931

IN spite of economic depression and an influenza outbreak during the early part of the year the death-rate for the United States and Canada will probably be lower for 1931 than ever before, statisticians of the Metropolitan Life Insurance Company in New York predict from their study of the company's records of deaths among the industrial population during the first nine months of the year. "Regardless, however, of whether a new low point in the death-rate is actually reached, the 1931 health record to date is in many respects the most remarkable of all the years," the company reports.

The records of the company showed that deaths for the first three quarters of this year are only three quarters of one per cent. higher than last year's all-time record minimum death-rate.

The death-rate for tuberculosis dropped 7½ per cent. If this continues to the end of the year, the largest year-to-year decrease registered for this disease in ten years will be recorded.

The diphtheria death-rate also dropped to a new low of 3.9 per 100,000, which is one seventh of the rate twenty years ago. New low death-rates for the year are also expected for typhoid fever, diarrheal conditions and conditions associated with childbirth.

Another unusual feature of the year's health picture so far is that there has been no rise in the pneumonia death-rate, in spite of the influenza outbreak and high mortality from that disease. The diseases which showed important increases during the first nine months of the year besides influenza are cancer, diabetes and infantile paralysis. The influenza death-rate returned to normal after last winter's epidemic was over. A further slight increase in heart disease was noted, which if it continues will make a new high point in the mortality from this cause.

MOLD INFECTION OF FRUIT

ORANGES and other fruits that suffer heavy spoilage from blue mold and other fungi can be saved from this loss by a new method for detecting mold-susceptible specimens, the invention of Rev. Hugh T. O'Neill, and Dr. Arthur J. Harriman, both of the faculty of the Catholic University of America, Washington, D. C.

The inventors discovered that mold infection always takes place through breaks in the skin, such as may be made by clipper cuts, the fingernails of the workers, box splinters, projecting nails, etc. A whole-skinned orange never spoils. They were able to demonstrate this point by keeping more than 400 sound oranges in a damp, dark cellar a period of three months (May 1 to July 30) without losing one of them through moldiness, though moldy oranges were kept among them to provide abundant sources of possible infection.

Knowing thus that fungus spores can start trouble only if the skin is scratched or broken, the inventors next attacked the problem of making visible the microscopic nicks and scratches that escape detection in the grading as practised hitherto. They hit upon the scheme of using some substance that would enter these scratches and make a streak of contrasting color against the yellow skin. Of such substances, the most practicable is a metallic salt that will react with the tannin in the tissues just under the skin and form a dark, conspicuous substance. A salt of iron, preferably ferric chloride, is especially recommended. Any minute abrasion in the peel of the fruit is immediately made visible as a black line. Sound fruit is left entirely unmarked. All fruit, sound or unsound, is then washed in clear water so that all ferric salt is removed. The fruit then reaches the consumer without any substances that are poisonous or antiseptic. This obviates the use of borax, a substance much used to prevent blue mold infection but open to grave objection where such fruit is used to make marmalade or might be sucked upon by children.

Fruit found mold-susceptible by the new process would be culled out and sold for immediate use, or else used in canning or preserve-making or treated with a preservative. Father O'Neill, together with Dr. Harriman, has taken out patents on the process. Several of the leading fruit-packing firms have become interested in its commercial application.

ITEMS

A GROUP of faint nebulae, just visible through the large reflecting telescope of the Bergedorf Observatory in Hamburg, has been discovered by Dr. Walter Baade. He believes them to be considerably more distant than another group of faint nebulae, like those in the constellation of Ursa Major, which he discovered several years ago. These have been shown, by astronomers at the Mount Wilson Observatory, to be about 70,000,000 light years distant. Only one more distant group of objects has been measured—some nebulae in the constellation of Leo, which appear to be about 105,000,000 light years away. If the new Ursa Major group is more than this, it will be the most distant object known to astronomers. The newly discovered nebulae are within a distance of about half a degree of the star Merak, the pointer farthest from the pole star, at the corner of the great dipper diagonally opposite the handle.

THOUGH so faint that it can only be glimpsed in the very largest telescopes, Neujmin's comet, first observed in 1913 and now on its first return to the neighborhood of the earth, is being carefully watched by astronomers. It is a great astronomical rarity, for it is a member of Saturn's family of comets, and the second one that has ever been observed more than once. According to the "capture" theory, the larger planets, Jupiter, Saturn, Uranus and Neptune, have captured comets as they were moving through space. That is, as the comets came within the gravitational attractions of these bodies, they were pulled inwards enough to make them part of the solar system. They still show the identity of their captor, according to this theory, by making a close approach to the orbit of that body on each of their trips around the sun.

CALIFORNIA will probably have a drier winter than normal this year. This is indicated by studies just completed by Dr. George F. McEwen and Dr. A. F. Gorton, of the Scripps Institution of Oceanography at La Jolla. Observations over a considerable period of years have shown that offshore water temperatures higher than average are followed by winters drier than average, and, conversely, lower offshore temperatures indicate wet winters. This year's offshore temperatures have been appreciably above ordinary. The indication of the water temperatures is reinforced by the position of the 1931–32 season in what is known as the Brückner precipitation cycle. This is a long, gradual swing from wet to dry weather and back again, the total period being from 22 to 33 years. Indications are that this season is the low point of the long precipitation cycle.

AN enzyme has been found in liver which transforms carotene, the yellow coloring matter of carrots, into vitamin A, Mr. Harold S. Olcott and Mr. Duane C. McCann, of the State University of Iowa, have just discovered. The fact that carotene, which is found in other vegetables besides carrots, was changed to vitamin A in the body has been known for some time. The transformation has never before been performed outside the body, however. Preliminary experiments showed that carotene was destroyed and vitamin A appeared when carotene was kept in a warm place for a time with fresh liver tissue from the bodies of rats that had lacked vitamin A. It was supposed that the reaction was due to an enzyme. Further research, using a liver extract instead of fresh liver, proved this to be the case. It is suggested that the new enzyme should be called carotenase.

THAT radium to the value of hundreds of millions of dollars has been discovered in Canada, is the opinion of competent mining experts. The pitchblende bearing $150 worth of radium in every pound of ore, discovered by Gilbert Labine and Shirley R. Cragg, airplane prospectors, of the El Dorado Mines Corporation at Labine Point in the Great Bear Lake region, is equal in richness to the best ores of the Belgian Congo, which since 1922 have driven all competitors from the market. The new ore is described by geologists as "a very substantial deposit of high-grade material," yielding three to four grams of radium per ton. Twenty tons have already been shipped on a fur steamer of the Mackenzie River and forty more tons have been mined. Hundred-pound lumps were picked up on the surface. The radium from these will yield $70,000 a gram. Silver ore yielding $300 a ton has been found alongside. The Canadian discovery, consisting apparently of several thousand tons of ore, will add greatly to the world's present 600 gram total supply of radium.