THE SCIENCE NEWS-LETTER

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EDWIN E. SLOSSON, Director
WATSON DAVIS, Managing Editor

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STORM-RIDING SCIENTIST SOON TO TAKE TO THE AIR

Fifteen flights in a free balloon which will ride the storms in an effort to learn more about them are being made by Dr. C. LeRoy Meisinger of the central office of the U. S. Weather Bureau. The flights are part of the most ambitious plan for scientific exploration of the atmosphere ever to be undertaken and are being carried on through the cooperation of the Weather Bureau and the U. S. Air Service.

The flights start from Scott Field, Ill., not far from St. Louis. They are being made in a hydrogen-filled balloon, furnished and piloted by the Air Service, and equipped by the Weather Bureau with a full set of meteorological instruments. The first flight was scheduled for April 4. The balloon used is a large one, about 40 feet in diameter and holding 35,000 cubic feet of gas.

The main purpose of the flights is to study the motions of large masses of air with reference to the ground, when they are influenced by the great whirls in the atmosphere, hundreds of miles in diameter, which the meteorologists call cyclonic storms, and which in their passage across the country give us most of the many varieties of our weather. The motion of the air with reference to the centers of these storms is fairly well known, but these centers are always themselves in motion and just what happens to the air in them or above them is not understood.

Dr. Meisinger proposes to find out by going up in a balloon in the storm to a height of 10,000 feet, and then sticking by it as long as it is possible to do so, mapping out his location from time to time, and at the end charting the whole voyage, which will give the track not only of the balloon but also of the air in which it rode. He will take some trips in front of storms, some near their centers, others trailing behind them, and will study the behavior of the air in each case.

Observations will be made of the amount of dust in the atmosphere and of sky brightness, things of great practical importance to the aviator through their effect on visibility. An attempt will be made to measure the size of water drops when passing through the clouds.

Communication with the ground is maintained during the flights by radio

and carrier pigeons. The pigeons carry messages from the balloon to the base at Scott Field, while incoming messages are handled by a radio receiving set. Dr. Meisinger received weather bulletins twice a day from the central office of the Bureau, arrangements having been made with fifteen broadcasting stations to broadcast the bulletins. The stations used depend on where the storms happen to be carrying the balloon.

This is the first time that an attempt has been made to study the behavior of storms at first hand and the information which Dr. Meisinger expects to get will be of great importance in the study of the causes of the formation and continuance of storms, and so of service in forecasting.

READING REFERENCE - Talman, C. F. Meteorology, the Science of the Atmosphere. New York, P. F. Collier Sons' Co., 1922.

AMERICAN CORN MAY SUPPLY OUR SUGAR

Sugar from corn may soon be a reality on American breakfast tables. By a process devised at the Bureau of Chemistry, U. S. Department of Agriculture, maltose, an edible sugar, much sweeter than glucose, has been made from cornstarch. It may also be made from hominy or tapioca.

The process does not depend upon chemicals, but is in many respects similar to the natural conversion of starch to sugar in the cells of living plants or animals. The cornstarch is merely mixed with warm water to which malt has been added and the resulting product subjected to the same processes of clarification and evaporation required in the manufacture of cane sugar from sugar cane or sugar beets.

This action of malt has been known to chemists for many years, but has hitherto not been susceptible to commercial production. In practice the results were very uncertain and frequently the whole batch of material spoiled. But now the secret cause of all these troubles has been discovered by H. C. Gore of the Bureau of Chemistry and production of maltose from corn on a commercial scale equal to that of glucose is regarded as more than a possibility.

Too many hydrogen ions, not too many cooks, is what spoiled the broth of earlier workers, Mr. Gore found. Hydrogen ions are electrified hydrogen atoms. They split off from many chemical substances in solution, chiefly from acids. They make things taste sour. It is necessary to carry on the reaction in the presence of a certain and carefully controlled proportion of hydrogen ions. There is the trick of the thing by which Mr. Gore can produce nice white candy from the golden corn.

Maltose, although a sugar, is not the same as cane or beet sugar. Neither is it the same as glucose. It is more than twice as sweet as glucose and about three-fifths as sweet as cane or beet sugar. It is as wholesome and nourishing as they are.

The United States now consumes about 5,600,000 tons of sucrose, the sugar made from cane and sugar beets. Of this 2,800,000 tons are imported. In addition, we eat in the neighborhood of 1,000,000 tons of glucose. The importance

of Mr. Gore's discovery lies in the possible replacement of some of the imported sucrose or home-made glucose by maltose, which is cheaper than sucrose, sweeter than glucose and apparently easier to prepare; and which can be produced from the almost inexhaustible source of American grown corn.

Commercial interests are showing interest in Mr. Gore's discovery and in one instance have offered part of their plant equipment for further experiments on a large scale.

THE BUILDING BLOCKS OF THE BODY

By Dr. Edwin E. Slosson,
Director, Science Service.

It is fascinating to stand on the sidewalk and watch a building being put up by modern methods. The materials seem to appear by magic just when they are needed. The stones, cut and numbered, are delivered in proper order. The big steel girder arrives at the moment when its bed is prepared for it. Enough bricks are always on hand to keep the bricklayers busy and not many more. Sand, gravel and cement come along in the right quantities to mix for concrete, and little, if any, is left over at the end of the day. Doubtless, it is not all such smooth sailing as it seems. The boss may have his moments of worry over delayed delivery or the premature arrival of certain material. But the system must be well arranged, for on a narrow city lot there is little room for the storage of excess stuff, and the builder must live, so to speak, "from hand to mouth".

The building of our bodies has to be run on a schedule even more closely contrived than this, and physiologists are now beginning to comprehend its principles. Flesh and blood are largely composed of a sort of substances called "proteins", of which there are thousands of different kinds; enough to go around among all the animals and give each species a particular protein of its own. But these innumerable varieties are all made up of various combinations of a comparatively small number of simpler substances called the "amino acids" of which some twenty are now known.

How many of these several sorts are needed by any particular animal, such for instance as us, is yet undetermined. Probably a dozen, perhaps half a dozen, amino acids, if properly picked, would suffice. But our food must contain at least a little of every one of the set of amino acids that are required for the building of our bodies. If one of them is missing none of the others can altogether replace it. So, too, a typesetter must have some type in every box of his case. He cannot get along without a few x's and g's, even though he may have plenty of a's and e's. But if he has as many x's and z's as he has a's and e's, he cannot make use of them.

So a little of a particular kind of protein may be very valuable, indeed essential. But double the amount is not twice as good, may not, indeed, be any better. Prof. H. H. Mitchell of the University of Illinois found in the feeding of white rats that the biological value of protein from various foods ranked as follows: milk, 93.4; rice 86.1; yeast 85.5; oats, 78.5; corn 72.; potatoes 68.5; Doubling the amount of any one protein did not increase its nutritive value in proportion, but the addition of another kind of protein did increase in certain cases the value of both. For instance, rats fed on corn protein alone or on milk

protein alone did not thrive as well as when the two were combined, although the total ration remained the same. Since rats have been the messmates of man from time immemorial they have acquired similar feeding habits to ours.

The lesson of this for us is that we should see that we have a varied as well as an adequate diet. There is nothing found in these investigations to favor these food faddists who would have us live for life on a single kind of food, such as peanuts or grapes. Even if we could know precisely what proteins our body needed at the moment and had the composition of the food down pat, we would have to have scales and slide-rule at every meal to figure it out. Better leave this complicated problem to be carried on by the unconscious calculation of our digestive apparatus, which will generally come out right if supplied with the proper kinds and amounts of building materials. If any one of them is lacking the rest cannot be economically utilized.

Imagine the disgust of the construction boss if he should get several loads of sand and only one sack of cement. If it were a mistake in the kind of fuel delivered it would not be so bad. If there is a shortage of anthracite, one can use coke, or briquets, or even bituminous. But concrete has to be mixed in the proper proportions if it is to stand, so the boss having no storage space has to send away the excess sand unused.

So, too, in our body building. We neednot be so particular about our fuel foods. There are many kinds of sugars, starches and fats, but they are more or less interchangeable. No one of them is indispensable. The question of quality does not matter so much in this case, nor quantity either, so long as there is enough of any of them. And if we eat too much of fats and carbohydrates, as many of us do, the surplus is disposed of with comparative ease or stored up in the body as fat. It is indeed a burden to travel with so much excess luggage as some of us do, but we get along.

The proteins may also in part be burned up, but their waste products are much more difficult toget rid of and are particularly obnoxious if allowed to accumulate in the body. So one of the delicate and difficult points in the problem of dietetics that we all have to solve every day is to see that we get proteins in sufficient assortment, quite enough of them, and get not much too much.

READING REFERENCE - McCollum, E.V. The Newer Knowledge of Nutrition. New York, Macmillan Co., 1922.

A ROUGH HANDSHAKE

The bore whose talk provokes weariness is well known. Mere handshakes which cause headache are perhaps less familiar. Familiarity with these is often gained by greeting a nitroglycerin worker in the conventional way. The readiness with which the skin absorbs nitroglycerin poison is amazing. And whether inhaled or taken through the skin, the characteristic "powder headache" produced by the effect of this substance on the tiny blood vessels of the body is the result.

The American people, who number 6 per cent of the population of the globe, use 63 per cent. of all the telephones in the world.

AMERICAN DRUG MAY BE SUBSTITUTE FOR GERMAN

Discovery that an American drug, tryparsamide, developed in the Rockefeller Institute and used in the treatment of paresis, can be substituted temporarily for the German drug used in the treatment of African sleeping sickness has been announced in London, according to a report just received by the American Medical Association.

The German drug is known as Bayer 205. Its formula is a carefully guarded secret which it has been hinted Germany would be willing to trade for the recovery of her former African possessions. Immense areas of centralAfrica have become unfit for human habitation because of the prevalence of the sleeping sickness, which is caused by a parasite carried by the tsetse fly, and Bayer 205 is claimed by its inventors to be a specific cure for the disease. It was brought out in the discussion in London that while its exact composition is unknown, it is known to be a complex organic anilin substance of which the nucleus is trypan blue.

Some animals and men on whom Bayer 205 was used became drug fast, or resistant to the effects of the drug. Attempts to overcome this conditions have resulted in the discovery that other remedies such as antimony tartrate or tryparsamide may be substituted temporarily for Bayer 205.

BETELGEUZE, ERRATIC GIANT OF THE HEAVENS

By Isabel M. Lewis,
U. S. Naval Observatory.

No star in the heavens has been more before the public eye in the past few years than ruddy Betelgeuze in Orion which now shines so brilliantly in the southwest in the early evening. Betelgeuze leaped into fame in the winter of 1920 when, chosen as the object of the first test in measuring the diameters of the stars with the Michelson interferometer attached to the 100 inch telescope of the Mt. Wilson Observatory, it was found to have a diameter of over two hundred million miles.

Betelgeuze is not only a giant, however. It is a most erratic giant. Later measurements with the interferometer showed variations in its diameter such as have not been found in the measurements of the diameters of other giant stars with the same instrument. This fact taken in connection with the fact that Betelgeuze has long been known as a star that varies irregularly in brightness makes it appear that it is irregularly contracting and expanding in size, pulsating, like somemighty heart of the heavens. The brightness apparently increases with contraction and decreases with expansion of the star.

Betelgeuze is now at its maximum brightness. It is more brilliant than Rigel, the bluish-white star in Orion diagonally opposite to it, toward the southwest, and it has been rivalling and at times surpassing Capella, the beautiful golden star in Auriga to the northwest of it. It is also much brighter at the present time than it was a year ago. When at its minimum brightness it is decidedly inferior to Aldebaran which is in the V of the Hyades in Taurus to the northwest of Orion and which to the ancients represented the baleful, red eye of

Taurus, the Bull. At maximum brightness Betelgeuze is over three and a half times more brilliant than it is at minimum brightness and the change may take place within a year or less.

Aside from the fact that the diameter of the star is changing continually as a result of its irregular contraction and expansion, there is an additional uncertainty as to the actual size of Betelgeuze which results from the uncertainty as to its distance. To change the angular diameter, that is given by the interferometer, into miles, it is necessary to know the parallax of the star which is simply the angular distance between earth and sun as viewed from the star. This value can be obtained in a variety of ways. According to the latest report from the Mt. Wilson Observatory, the best value of the parallax of Betelgeuze is seventeen thousandths of a second of arc. That is how far apart in angular measure the earth and sun would be at the distance of Betelgeuze. This value gives 190 light years as the distance of Betelgeuze from the earth and a diameter for the star of 245,000,000 miles.

Very recently the parallaxes of over one thousand stars have been determined at the Dominion Astrophysical Observatory at Victoria, B.C., with the 60 inch reflector by the spectroscopic method, and in this list we find for Betelgeuze a parallax of one hundredth of a second of arc, which would place Betelgeuze at a distance of about 325 light years and give the star a diameter of over 400,000,000 miles. It is possible, then, that Betelgeuze may be even larger and more distant than earlier estimates have made it. It is probable that its size has been underestimated rather than overestimated, and it may closely rival if not surpass Antares, which is estimated to have a diameter of about 400,000,000 miles.

With the value of the parallax found at the Dominion Astrophysical Observatory, the actual brightness of Betelgeuze comes out about five thousand times that of the sun. If the sun and Betelgeuze were placed side by side at a distance of thirty-three light years from the earth, the sun would appear as a faint star of the fifth magnitude, but Betelgeuze would be as brilliant as Venus as it now appears in the western heavens.

READING REFERENCE - Hale, George E. The New Heavens, New York, Charles Scribner's Sons, 1922.

NEEDS LITTLE TIME TO FIND HOW LITTLE STUDENTS KNOW

Short and snappy exams are just as accurate in testing college students as those four times as long, Dr. Donald A. Laird, National Research Fellow in Yale University, has discovered.

He examined 67 psychology students with 80 questions which could be answered by a single word or short phrase in one hour and a half. Scoring the first 20 questions on the percentage of correct replies and correlating these figures with those obtained on the basis of the full test of 80 questions he found there was only a slight difference. He also scored the first 40 and the first 60 questions as if these sections had been the full test and found that the correlation increased but slightly.

He admits, however, that the shorter examination would not satisfy the professor who delights in instilling fear of examinations in the hearts of his students.

ENGINEER WRITES RECIPE TELLING

HOW TO COKE COAL IN NEW WAY.

By R. S. McBride, Engineer-Chemist.

If writing a cook book for coal users, one would probably include the following recipe for high-temperature or metallurgical coke: Take about ten tons of low-ash high-volatile coal and about two and a half tons of low-volatile coal of good coking quality. Grind each separately until all will pass through a screen of one-quarter inch mesh and then mix thoroughly. Bake about 18 hours in a very hot oven, at not less than 2000 degrees Fahrenheit. When done, push from the oven while hot, cool quickly by showering with water, screen into various sizes and market each size at the highest price which local conditions permit. This, in its essential points, is the usual method of making coke in by-product ovens.

Such a coke-making process produces not only large coke for blast furnaces and foundries, smaller size coke for domestic heating, and some coke so fine that it must be burned under large power-plant boilers, but also coke-oven tar (really a variety of coal tar), ammonium sulphate for fertilizer manufacture, motor benzol which can be used in making special auto fuels, and coke-oven gas which is a splendid industrial fuel as well as finely suited to city gas supply. Incidentally, under most circumstances the plant makes a profit, not the least important consideration to the investor.

Such process is carried on at a very high temperature, which necessitates the construction of the oven from the best refractory materials and the operation with the utmost skill. It has long been the ambition of inventors to carry out the same operation at a much lower temperature, say, at about 1000 to 1200 degrees Fahrenheit. This would be a great advantage, because it is much easier to construct an oven which will stand this bright red heat than one which will operate 24 hours a day throughout the year at the white heat needed for the high-temperature oven.

For low-temperature coke one recipe of our coal cook-book would be as follows: Select a good quality of high volatile coal and grind it as for high temperature coke. The coal should be selected to give the maximum yield of valuable by-products without regard to the mechanical nature of the coke it will produce. Feed the coal at about a ton an hour into an oven maintained at red heat (about 1200 degrees Fahrenheit) in which it can be stirred continuously as it cooks. Allow the semi-coke to discharge continually, or at short intervals, from the lower end of the inclined oven into a cooling chamber so that it will not take fire in the air. Recover gas, tar, ammonium sulphate and motor benzol about as usual for high temperature coking.

The above recipe would work well at the Carbocoal plant in West Virginia which was, in fact, the first commercial-scale low-temperature installation in the United States, and followed just that scheme. But for the low temperature

plant recently erected for Henry Ford in Ontario, Canada, we would have to write a different instruction for the cook. In this plant the ground coal is fed in through a hopper onto metal plates which pass through the oven floating on top of a tank of molten lead. Thus a thin layer of the ground coal is heated very quickly, and a large amount of coal can be carried through an oven of limited size.

From any of these low-temperature plants the semi-coke comes out in a granular form or in soft pieces which can easily be broken up in the hands. It is, therefore, not at all suitable for the blast furnace, nor can it be burned in this fine condition in the ordinary household furnace. Moreover, because it has been heated at a lower temperature not all of the volatile material originally contained has been driven off; this is why it is called semi-coke. In its manufacture there is less gas and less ammonium sulphate formed; but it happens, a considerably larger quantity of tar and oil is produced under these conditions - sometimes twice or even three times as much of such liquid products are made as in a high-temperature oven.

As yet none of the low-temperature coke processes have proven to have any large commercial success. This is probably largely because of the early stage of their development in which they still remain. Engineers have not yet developed as efficient and as dependable mechanical systems of handling the low-temperature process. Moreover, industry has not yet discovered just how to use to the best advantage the semi-coke and the oily tars, both of which differ radically in character from the corresponding solid and liquid products of the high-temperature system. The semi-coke could be burned as it is; but generally this is impracticable. Hence it commonly must be formed into briquets before it is suitable for furnace use. The tars, which contain much larger quantities of certain valuable oils than those from the high-temperature oven, though promising good things industrially, are still largely unstudied. Until more is known of just what these tars contain and how the chemists can separate and use these constituents, low-temperature tar cannot expect to have as large a market value as doubtless will eventually develop.

Low-temperature coking is still in its infancy. The recipes for such culinary treatment of coal are yet much in need of engineering coking-school research. But the engineer is not likely to neglect this field, because the products from low-temperature coking promise to be equally as attractive to the industries as are the products of the skilled French chef to the hotel guests.

FOOD CANNOT GO SIDEWAYS IN PLANTS

When an animal eats, its whole body is nourished by the food that is absorbed at any one point. This is far from being the case with woody plants, however, according to research at the Maryland Agricultural Experiment Station. Dr. E. C. Auchter has found that "the mineral nutrients absorbed by the roots on one side of a plant are in a large measure translocated to and used by the trunk, limbs and leaves directly above them."

In the experiments on which this conclusion is based, Dr. Auchter discovered that if fertilizer was applied around only half the base of a tree the twigs on that side only showed any benefit from it. When nitrate of soda was applied to half the roots, the leaves above these roots were shown by chemical

analyses to have gained in nitrogen content. On the other sides of these trees the leaves showed no increase in nitrogen content, and sometimes actually a decrease.

READING REFERENCE - Genong, W. F. The Living Plant; a description and interpretation of its functions and structure. New York, Henry Holt and Co., 1913.

DRIVE TO SAVE CORN BELT LAUNCHED ON OHIO FRONT

The United States Corn Belt, the world's greatest food producing area, is threatened by the advance of a European insect army. To meet the menace of the invading corn borers at the frontier, eighty entomologists, agronomists, and county farm agents from Illinois, Indiana, Ohio, and the Federal government will in April officer a great offensive along a wide front in northern Ohio, according to war plans outlined here today by Prof. George A. Dean of the U.S. Bureau of Entomology.

An expert will be placed in every township of the infested area and some 20,000 farms will be visited to show farmers how to check the spread of the insects by destruction of the remnants of last year's crop. Later in the season some 50,000 insect allies drafted from among the foes of the corn-borer in its native land will also be used in the fight.

The European corn borer entered America very probably in broom corn shipped from Italy or Hungary. It was discovered attacking sweet corn near Boston in 1917, and since then it has been a limiting factor in the growing of sweet corn in eastern Massachusetts. Another extensive area was occupied around Schenectady, New York. The insects also gained a foothold in a wide section north of Lake Erie in Ontario, Canada. Later the territory along the American shore of the Lake in New York, Ohio, and southeastern Michigan, became infested. Last year a marked spread of corn borers was noted in northwestern Ohio which is the beginning of the great corn belt of America.

The strategic importance of this infestation in respect to the Corn Belt aroused other corn raising states. Illinois, two hundred miles from the present front, is sending experts to Ohio to cooperate in the work, as is the yet uninvaded state of Indiana. Canadian authorities are also working with the Americans to control this dangerous enemy.

In the Fall, the corn borer, in the form of a brownish caterpillar or worm about an inch long which has been tunneling into the plant, hibernates for the winter.

As soon as warm weather begins in April or May, the borer becomes active again and about the middle of May it cuts a small circular opening from its tunnel to the surface of the plant in order to provide an exit for the future moth. It then closes this hole with a thin partition of silk and goes back into its dugout gallery where it spins a thin cocoon. About the first week of June, the borer emerges as a moth which can cover as much as 400 yards in a non-stop flight and travel anywhere from five to ten miles. The female moth usually lays

her nearly flat little eggs in clusters on the under side of a leaf. The young borer, hatched from these eggs, eats for awhile on the leaves, and then starts digging itself into cornstalks, corncobs, weeds, or other plants, where it completes most of its development, incidentally injuring the plant.

The corn borer attacks all parts of the plant, and while it prefers corn and sorghum there are some 200 species of plants which it is known to attack. The most successful method of getting rid of this pest has been found to be the destruction of the remnants of the crop in which the borers hibernate.

Entomologists at the United States laboratory at Hyeres, near Marseilles, France, have discovered a parasite known as Exeristes roborator, which may prove an effective ally in checking the further spread of the borers by preying on their young which it is able to locate through corn stalks or even burdock stalks. Fifty thousand of these insect foes of the corn borer will be released this summer in the infested areas of Ohio and New York.

TABLOID BOOK REVIEW

SOCIAL AND POLITICAL IDEAS OF SOME GREAT MEDIAEVAL THINKERS. Edited by F.J.C. Hearnshaw, Professor of Mediaeval History in the University of London. New York; Henry Holt & Company, $3.00

A series of lectures compiled in order to inspire an interest in the ideals of the Middle Ages. It is written in simple language and contains extensive notes in reference to all historical or obscure passages. The lectures were originally delivered by a group of distinguished men at King's College, University of London.

CHEMISTRY EXTENDING ITS FRONTIER. Published by Harvard University.

An attractive pamphlet telling of recent applications of Chemistry to industry and daily life, of its future developments and of what Harvard has done and is doing for the advancement of the science.

BROKEN BRANCHES

Damage to trees by ice storms has recently been investigated by Prof. Walter E. Rogers of Lawrence College, Wisconsin. He checked up on a number of trees of different species of well-known kinds and found that a species of Catalpa lead all the rest in resisting the effects of the ice. A variety of spruce came second, with a pine third. The sturdy oaks lived up to their reputation for strength. Elms and poplars were among the trees most damaged by the accumulating ice.

At the highest point reached by man, about six and one-half miles, the air pressure is less than a fourth of what it is on the earth's surface, and the average temperature is 50 degrees below zero.
