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PAPERS PRESENTED AT THE MINNEAPOLIS MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

BY DR. FRANK THONE

SCIENTISTS who attended the summer meeting of the American Association for the Advancement of Science occupied themselves with the inspection of numerous exhibits which were arranged to show recent progress in a dozen fields of science, from anthropology to zoology. The center of interest in the medical exhibit was a demonstration of the causes and prevention of heart disease, by Dr. H. M. Nathanson, of Minneapolis. He has found a number of middle-aged people whose hearts he can stop at will, by pressure on a certain nerve in the center of the throat, and then start again by the administration of adrenalin and related drugs. Dr. Nathanson uses this procedure in critical tests of relative values of various heart medicines, as well as for the scientific study of the two principal causes of "heart failure," cardiac standstill and ventricular fibrillation. Another medical exhibit showed the usefulness of a preparation known as thorium dioxide sol in the more accurate x-ray diagnosis of cancers, tumors and other malignant conditions of the internal organs. This substance seems to have a tendency to concentrate in such tissues, so that they cast denser shadows on the photographic plates when x-rays are turned on the suspected body regions. An exhibit that attracted much interest was one bearing on the still-vexing riddle of ancient man in America, arranged by Professor A. E. Jenks, of the University of Minnesota. Outstanding in this display was the skeleton of a human being found in Minnesota, associated with stone dart points of the Yuma and Folsom types, closely resembling similar weapons that have been appearing in increasing numbers in apparently quite ancient deposits. Some of them, found in the southwest, have been mixed with the bones of extinct species of bisons. Other flint points of the same type, not associated with human remains, have also been discovered in Minnesota. Even older than the "Brown's Valley" skeleton found with these dart points is a famous skeleton, known as "Minnesota Man," discovered by Professor Jenks some time ago. This was on display, together with the implements and ornaments associated with it.

AMERICA will soon be scraping the bottom of the barrel for some classes of indispensable mineral supplies, according to Dr. C. K. Leith, of the University of Wisconsin, and member of President Roosevelt's National Resources Board. Gold production in this country has long since passed its peak, he said. Measured reserves of oil, zinc and lead will last only about fifteen years at the present rate of use. Copper will be gone in forty years. There are centuries' worth of iron ore, but the reserves of really high-grade iron ore are good for only about four decades at the most. There is enough coal of all grades to last 4,000 years, but really good coal in readily accessible places will not feed our furnaces for more than two centuries. To remedy this situation as far as possible, slowing down exhaustion where it can not be finally avoided and thus at least staving off the evil day of mineral hunger, Dr. Leith recommended a program designed to leave the mineral resources to private enterprise, but at the same time to lend the authority of the Federal Government to support cooperative efforts toward ending the waste and other abuses. To implement this, he proposed some sort of a Federal Conservation Board, with flexible power within limits imposed by a general enabling act. He believed that a set-up of this kind is possible without a constitutional amendment.

SLEEPY seeds and how they are aroused formed the subject of a group discussion among the plant physiologists. The dormancy of seed wheat varies according to the degree of ripeness attained when the wheat is harvested, according to researches by Drs. A. H. Larson, John Larson and R. B. Harvey, of the University of Minnesota. Cereals go through their customary "rest period" quickly at high temperatures, but if kept near freezing they lie dormant for several weeks, although given all other conditions favorable for germination. At the same symposium Professor Charles A. Shull, of the University of Chicago, told of differences in the dormancy of very closely related plants. He worked with the seeds of rose mallows, which are all one species, but differentiated through cultivation into several horticultural varieties. He found that the seeds of the different varieties are as distinct in their hardness and resistance to germination as their respective flowers are in shape and color. Dr. E. D. McAlister, of the Smithsonian Institution, Washington, D. C., reported that some light rays cause seeds to stay "asleep," others tend to wake them up. The "sleep rays" most effective on lettuce seeds were of wave-lengths around 7,600 ångstrom units, in the red part of the spectrum. The "arousers" centered around two wave-lengths, one at 7,000 ångstroms in the red, the other at 5,200 ångstroms in the yellow.

RECENT studies of the Brückner cycle, in which about 35 years elapse from drought to drought, show that the last great disastrous dry period in the West ended with the nineties, just 35 years ago. And the last great drought before that was in the sixties, another 35-year interval. The possible significance of the Brückner cycle was discussed at the meeting by Eric R. Miller, meteorologist in charge of the U. S. Weather Bureau station at Madison, Wis. The first person to mention a 35-year climatic cycle in print was Sir Francis Bacon, that versatile Elizabethan Englishman who was politician, essayist, lawyer and dilettante scientist. He referred to this phenomenon in his essay "On the Vicissitudes of Things." Three centuries later, a studious German, Eduard Brückner, made a really scientific study of the

matter, taking into account such apparently unrelated things as lake levels, dates of the melting of river ice, vintage times, as well as the direct weather records. Brückner's investigations brought the data down to the middle of the nineteenth century. Mr. Miller has taken up the study where Brückner stopped, and carries the cycle study through to 1935, using principally data of American meteorological observatories. Although his results are not as clear-cut as he would like to see them, due largely to the short time covered by really reliable weather records in this country, they suffice at least as an indication of weather trends. So far as his data go, they show that droughts in the past have ended suddenly, with a sharp upturn toward cooler, rainier periods. The patterns shown by the low-rainfall curves of the sixties and the nineties have been followed closely so far this year, with a clean-cut upturn from the curve of the great drought of the thirties.

WAS prehistoric man in America a hunter of mastodons and mammoths, as ancient European man was? This question, to which science as yet has no positive answer, is raised by a group of ivory objects collected in the upper Mississippi River Valley which were displayed before the meeting. Dr. A. E. Jenks, of the University of Minnesota, in charge of the exhibit, discussed the significance of the ivory objects. The collection is not large; two ornamented armbands, much broken; a three-cornered scraper with sawlike teeth on one side accurately carved in imitation of bear's teeth, and a tubular pipe, shaped like half of an enormously thick cigar, constitute the whole of it. Part of the objects were found buried below ground level, under an Indian mound that had nothing in it. They are all made of genuine elephant ivory. The workmanship is clean-cut and symmetrical, and the ornamentation, though simple, is competently applied. But whether the long-dead hunters slew the beasts and carved their ivory fresh, or whether they merely found it, or dug it up as fossil ivory, as men still do in Alaska and Siberia, there is at present no way of knowing. Lloyd A. Wilford reported that another tribe of old-time Indians in Minnesota once practised a unique form of cannibalism. A University of Minnesota expedition discovered a number of burials consisting of broken bones and empty skulls, their condition suggesting that the bones had been cracked to extract the marrow and the skulls cut open to extract the brains. The flesh was presumably eaten, but the bone marrow and the brains were probably used in the tanning of skins or for other industrial purposes. The scraps of skeletons were then gathered in bundles for burial.

DRS. THEODORE L. SQUIER and Frederick W. Madison, of Milwaukee, Wis., addressing a medical audience at the meeting of the association, stated that a very serious blood disease, in which white blood corpuscles are destroyed to a dangerously low number, is physiologically related to hay fever, asthma and other allergic troubles. This malady, known to physicians as granulocytopenia, has come into increased prominence recently, with the wide-spread use of pain-allaying drugs based on amidopyrine. It has been commonly thought that the drug caused the disease simply by poisoning the systems of its ill-advised users. However, Dr. Squier pointed out that considering the large number of users, many of whom take massive doses without being affected, a different type of action must be considered as a cause. Further, patients who have recovered from attacks of granulocytopenia sometimes become seriously ill again from extremely minute doses, which is exactly the way in which hay fever or asthma is brought on in persons "sensitized" to such things as pollens, feathers or hair. Medical use of music, in carefully prescribed "doses," has become a useful therapeutic measure in public welfare institutions, according to a report by Dr. Clara E. Liepmann, of the Russell Sage Foundation, New York City. Ancient and primitive peoples have made medical use of music, but with a difference. Their systems were based mainly on magic; modern medical music makes use of the researches of psychologists.

AS with animals, so with plants. Professor O. S. Aamodt, of the University of Wisconsin, called attention to the difference between yellow corn and yellow corn as sources of the important vitamin A. This vitamin seems to be connected with the yellowness of the grain; but not all yellow corn varieties are of the same value in this respect. There are three hereditary "Y" factors that produce it. Strains of corn possessing all three have correspondingly high vitamin value; strains with only one or two are not so good. But mere possession of the right kind of hereditary factors or genes is not enough to make one of the living pieces of producing farm machinery efficient. Environment has a lot to say about the expression of inherited excellences. The most highly drought-resistant wheat, for example, may not have a chance to "show its stuff" in non-drought years; and frost-resistant plants need frost to develop their superiority to their tenderer vegetable cousins. Professor Aamodt described a "drought machine" of his designing, which enables him to test resistant grain varieties without having to wait for a bad farm year to try them out in the field. The speakers stressed one great element of difficulty in "designing" most efficient farm animals and plants and "constructing" them by means of breeding procedures. The desirable qualities may be known, and the breeder may know how to combine them for the best possible results. But these good qualities may be so inseparably linked to less desirable qualities as to defy all efforts to choose the good and reject the ill. Thus, a pig with just the right firmness of meat may have the wrong shape for profitable marketability, or a drought-resistant variety of wheat may not mill into very good flour.

BETTER meat, but at less cost, is one of the objectives of modern scientific animal breeding, Dean W. C. Coffey, of the University of Minnesota College of Agriculture, explained before the meeting of the association. This objective is to be obtained by selecting for breeding purposes lines of animals that not only look handsome and

cut up well on the butcher's block, but in addition have highly efficient digestive and assimilative systems and are therefore able to form more meat out of a given quantity of feed than ordinary, unselected animals can. Some breeding stocks now at the university farm at St. Paul have had this "nutritional efficiency" so well developed that the best of them can make twenty-five per cent. more meat out of a given weight of feed than the least efficient feeders are able to show "in pay for their keep." In selecting a sire for the flock the breeder or farmer must look for high average in offspring, rather than a few fancy animals that will take blue ribbons, while all the brothers and sisters are little better than scrubs.

MANKIND'S ills can often be combated best not by direct treatment of patients but by studies of the way insects, worms, plants and other apparently unconnected organisms live in a disease-ridden region. The importance of such studies was stressed by Dr. Richard P. Strong, professor of tropical medicine at Harvard University Medical School, in the course of the Maiben Lecture in Medicine, which he delivered before the meeting of the American Association. Ever since the discovery of the rôle of mosquitoes in transmitting malaria, oil, swamp drainage and other sanitary measures have been more important than quinine in getting rid of that disease. Dr. Strong pointed out the marked correlation between prevalence and deadliness of malaria in some parts of the South, and the neglect of anti-mosquito work in those communities, due either to indifference or lack of funds. Other insect-borne diseases that are best reached through their insect carriers include yellow fever, typhus fever and African sleeping sickness. Sometimes the cycle of transmission is more complex, including some other animal besides man in the list of hosts to the disease-causing germ or parasite. Such, for example, are bubonic plague, where the carrier insect is a flea that bites rats and men indiscriminately, and tularemia, where rabbits are the alternative hosts. Again, the environmental or ecological influences take effect on man himself, making him susceptible to diseases under certain conditions, while at other times or in other places he may be immune. Or the factors may operate on the causal organism, making it virulent under some conditions and harmless under others.

IRON, one of the oldest medicines in the world, is still one of the most dependable for certain types of anemia, according to Dr. Walter A. Bloedorn, of the George Washington Medical School. Prescriptions as far back as 1600 B. C. required the use of iron, he said, and it has been used in hundreds of formulae since. Blaud's pills, first used over a century ago, are still a standard remedy for certain types of anemia. The human body is not at all efficient for absorbing and using iron, so that relatively enormous doses have to be given to give the patient the needed benefits. However, there is apparently no danger in the use of iron; it seems to be impossible to administer an overdose. Also discussing anemia in its various phases was Dr. William P. Murphy, of the Peter Bent Brigham Hospital, Boston, Mass. Dr. Murphy described the new concentrated liver extract so potent that one cubic centimeter, prepared from an ordinary-sized slice of liver, has the anemia-preventing power of eleven pounds of fresh liver eaten in the ordinary way.

FACTORY-LIKE efficiency is required of farms nowadays. Their productive "machines" are living cows and pigs, cornstalks and wheat plants. These offer problems in biological engineering that differ from those which chemical engineering must solve for industry only in being much more difficult and complicated. When a set up of these living productive machines fails to deliver goods up to specifications, it must be discarded, just as iron machines in factories must be scrapped when they fail. Newer and more profitable models must replace the discarded ones. These analogies of urban industry found on modern farms developed at the meeting in the discussion of genetic problems as applied to agriculture. A specific example of exacting market specifications which biological engineering must modify its "machines" to meet was presented by Professor J. L. Lush, of Iowa State College, Ames. He cited the Englishman's demand for having his breakfast bacon "just so"; the strips of a certain length, as wide at one end as at the other, and with a proper proportion between the streak's o' lean and the streaks o' fat. Hog raisers who want their share of the profitable British bacon market have had to go in for breeding extra-long pigs, so as to produce the maximum number of slices. They have also had to breed for less fat on the back and more underneath, to keep the strips of even width from end to end, and to maintain that almost mystical ratio between fatness and leanness.

WHOOPING-COUGH danger can be greatly reduced if babies are inoculated when they are about eight months old with a vaccine made from the germ held responsible for the disease, known to medical science as *Bacillus pertussis*. Tested now on many hundreds of babies, it has proved successful in totally preventing the disease in 90 per cent. of all cases where the vaccinated child was exposed by contact with another who was suffering from whooping cough. This recent advance in the battle against one of the most troublesome, and frequently fatal, among children's diseases was described by Dr. Louis Sauer, of the Northwestern University Medical School. The vaccine was first prepared several years ago, and at the outset used very cautiously in a limited number of cases. But when it proved to produce no ill effects and to confer immunity in an overwhelming majority of cases, more confidence seemed justified and larger numbers of vaccinations were made.

WHEN your head grows longer, it does not grow wider. That is, a difference in size usually means also a difference in relative proportions, or shape. This generalization is called "anatomatic lag" by its originator, Professor Wilson D. Wallis, of the University of Minnesota. It holds good not only for heads but for hands, feet and other body parts as well, and he considers it probable that the same principle will be found to extend to all portions of the animal kingdom. Indications that this may be true have already been found in the measurement ratios of some of the lowest of animal forms, one-celled creatures visible only through a compound microscope.