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THE EFFECT OF LIGHT AND HEAT ON PLANT GROWTH

SPRING wheat harvested 35 days after sowing, red clover in flower 38 days after seeding, a large head of lettuce grown in three weeks. These are the remarkable results obtained through the use of artificial light, heat and atmosphere at the Boyce Thompson Institute for Plant Research at Yonkers, N. Y.

Three things are responsible for this speeding up of plant growth, Dr. John M. Arthur explains in a report to the Engineering Foundation. One is bright illumination, in some cases for 24 hours a day. Another is high temperature. The third is increased amounts of carbon dioxide in the atmosphere.

The researches were made in an effort to find out how plant processes may be made more efficient. Photosynthesis, the method by which light causes substances to combine, makes plant growth possible. In nature it is a very inefficient operation. Only about one per cent. of the energy that falls on the plant is utilized.

"An unusual opportunity for the efficiency expert!" Dr. Arthur says. "If only a few tenths of one per cent. could be added to the efficiency of photosynthesis, an enormous increase would be available in total energy fixed when applied to nature's vast quantity production. Over one hundred years ago, de Saussure showed that green plants not only use the small amount of carbon dioxide normally in air, but can use more when available. These facts indicate a means of increasing the efficiency, yet no application was made until the recent world war. Then, under pressure of food shortage in Germany, processes were perfected by Riedel and others for scrubbing gases from combustion of coal, coke and charcoal to produce carbon dioxide. The gas was piped into greenhouses among growing plants. With high temperature and high light intensity a concentration of less than half of one per cent. of carbon dioxide will about double the dry weight of plant tissue produced."

Many plants can use more light than they get from nature. If such plants are kept continually under an arc light, or if artificial light is used to supplement daylight, their growth is hastened. Wheat and clover will stand full 24 hours of light a day. The tomato, however, needs a rest, and it grows fastest with 12 hours of daylight and 6 more of artificial light.

Commercial application of these facts is not yet in sight, Dr. Arthur points out. Every day 1,500 kilowatt hours of electricity were used during the plant tests. The ordinary home seldom uses more than one kilowatt hour a day. From researches like these may come in time new means for producing some foods and fuels and other supplies for human needs. Economic achievement, however, yet appears remote except in small scale operations.

DRAINAGE FOR TREE GROWTH

DRAINAGE for agricultural purposes has been carried to the point of being too much of a good thing in the mid-northwestern states, but conducted on a more moderate scale for forestry purposes would be a very good thing, in the opinion of Rafael Zon, director of the Lake States Forest Experiment Station at Madison, Wis. Bone-dry drainage of bogs, swamps and small lakes has run ahead of the market demand for farm lands in the region and has put taxes up to a point most unpopular with the farmers, besides exposing the tinder-like peat to summer drought and hence giving rise to an abnormal fire risk.

But partial drainage of the wet timber lands, based on practical experience already obtained in Europe in the lands around the Baltic Sea, he thinks, would be a most profitable thing for both private and public forestry in America.

The typical timber swamp in the Lake States region has a zone of deep peat around its edge, which thins out gradually until it gives place to the sandy or loamy upland. There is a regular succession of trees from the water's edge outward, beginning with tamarack, and running through black spruce, cedar, balsam, black ash, red maple, white pine, birches and poplar to upland hardwoods, by blending stages. In general, the wetter the soil the more stunted and useless for lumber are the trees. This is partly because the water is acid, partly because it contains little or no oxygen for the roots to breathe, and partly because it hinders the normal bacterial population which would develop greater fertility in the soil.

Lowering the water table, or permanent level of soil water, remedies these and other unfavorable conditions and gives the trees a new lease of life. In one case cited by Mr. Zon, seven years after partial drainage, runty trees ten feet high and a little over a foot in trunk diameter had doubled their height and more than doubled their thickness. And experience in Europe, he says, has definitely shown that judicious partial drainage pays in dollars and cents.

ALASKAN EARTHQUAKES

EARTH movements around Alaska will soon be as extensively studied as those in other regions around the Pacific Ocean as a result of a series of investigations to be undertaken by Dr. T. A. Jaggar, chief volcanologist of the U. S. Geological Survey, who usually makes his headquarters in Honolulu. Now he is at Kodiak, Alaska, where he is installing a seismograph and other scientific instruments for the recording of movements such as earthquakes and earth tremors. The United States naval radio station at this point will communicate all records on the instruments to the other United States stations, as well as to other parts of the world.

The department in Dr. Jaggar's charge already includes the station at Kilauea volcano, Hawaii, and Mt.

Lassen, California. The work of these areas is closely coordinated and is very valuable for scientific study.

Instruments for the station at Kodiak have been constructed at the observatory here, and are to be shipped to Dr. Jaggar in a few days. They include a modern seismograph for recording earth movements, as well as other apparatus.

The Alaskan installations, it is said, will supply information that is very much needed, as there have previously been few accurate records for the area of the Northern Pacific. There are already numerous stations in Japan, Hawaii and California, so that in conjunction with these the Northern Pacific will be well provided for.

The region of southwestern Alaska and the Aleutian Islands is declared by Dr. Jaggar to be one of the most active volcanic areas in the world. It is entirely possible that earthquakes originate here that are felt in other parts of the world. The extension of scientific earthquake studies to this part of the world is expected to add much to knowledge of volcanoes and the earthquake phenomena associated with it.

R. M. Wilson has been placed in charge of the observation station here during the absence of Dr. Jaggar, and Roy Finch is in charge of the station at Mt. Lassen, California.

Following the completion of the installation work at Kodiak Dr. Jaggar plans to go to Unalaska, where he will make observations and later will install recording instruments. Cooperation not only of the government agencies in Alaska but of individuals and firms has been promised Dr. Jaggar in his work, since it is felt that his observations will be of benefit and interest to all who have contacts in this region.

BIRD LIFE OF THE SOUTH SEA ISLANDS

If you want an object lesson in the active process of evolution take a look at the reed warblers of Polynesia.

This is the advice of Dr. Robert Cushman Murphy, of the American Museum of Natural History, who this summer is compiling data on the Whitney South Sea expedition. This expedition for the last seven years has been making a detailed study of the little known bird life of the South Seas. It is financed by Harry Payne Whitney. Much of the time Dr. Murphy has been in the field. But this summer he is working on specimens brought to the museum while Rollo H. Beck heads the activities in the Pacific.

Regarding the reed warblers, Dr. Murphy holds that they are a vivid illustration of the working of evolution. The Polynesian Islands consist of countless spots of land dotting the southern Pacific. On each island reed warblers will be found. They are small birds related to the reed warblers of Europe. But the Polynesian birds are remarkable because on each assemblage of islands a distinct variation of the same genus has developed. These variations seem almost individual races, Dr. Murphy says, so do they differ from each other in size, proportion and color. They run all the way from large yellowish types in the Society Islands and the Marquesas to a very small, gray warbler on Christmas Island. Yet they all show unmistakable evidence of being the same species fundamentally.

These variations are a graphic example of the working forces of evolution. The birds, Dr. Murphy says, are of sedentary disposition. They do not roam, but stay on their particular islands where their needs are filled. Thus each group is entirely separated from its neighbors and has been free to develop along its own lines. The tendencies of each group's ancestors were unhampered and isolated and in due course they produced the widely divergent forms of the same original species which startle visitors to Polynesia.

MEDICAL EXAMINATION OF EGYPTIAN MUMMIES

Few if any of the ancient Egyptians suffered from syphilis, members of the hoi polloi had far better teeth than the ruling classes and Pharaoh Siptah of the nineteenth dynasty had a club foot. Such are some of the health facts about life in the valley of the Nile from three to six thousand years ago gleaned by recent research undertaken by Dr. Arnold Sach, of Heidelberg University.

Dr. Sach has just completed a detailed pathological examination of over 30,000 mummies in the hope of gaining some insight into the health conditions among the ancient Egyptians, a point of great interest to modern medicine because the Egyptians were known to have a comparatively highly developed art of healing. Malformations and bone fractures were the obvious things that came to the attention first and in many cases the mummies were found to be still wearing artfully contrived splints. Bladder stones were found in mummies dating back to periods before the earliest dynasties, indicating that this affliction was present from very remote times. Stones in the kidney did not appear until 3,200 B. C.

Degenerating teeth are evidently one of the prices mankind has always had to pay for an advancing civilization. Bad teeth were rare during the early period of Egyptian history, and in the poorer population almost entirely lacking. The teeth of 500 mummified remains of Egyptians of the highest class, excavated near Gizeh, showed nearly as much tartar formation and dental caries as those of modern Europeans.

Dr. Sach's researches constitute an argument for the negative in the controversy over the presence of syphilis in the ancient world, for no changes indicative of this disease could be detected in any of the mummies examined. The only case of leprosy occurred in one dating from the late Christian era, which strengthens the assumption that has been made that the leprosy of Biblical times is not the disease that we know. It is now thought that the leprosy of antiquity is a malady different from that which goes under the name at the present time and that its exact nature can only be explained by further research in historical medicine.

PSYCHOLOGICAL TESTS FOR DESERTERS

Cutting down an alarming number of naval desertions by preventing the deserting type of sailor from enlisting in the first place is a new achievement of the U. S. Navy.

How this has been brought about, largely by means of a special psychological test, is announced by Commander D. E. Cummings, U. S. N., in an account to appear in *The Personnel Journal.*

In 1923, the number of men who were unable to adapt themselves to Navy life had grown to excessive proportions. Almost one third of the separations from the Navy were desertions, and only 44.6 per cent. left the Navy by honorable discharge or transfer to the Fleet Reserve. Courts martial were at the rate of 18,000 a year, with an enlisted force of 86,000 men. Altogether, a serious situation.

To find out whether general intelligence has any connection with the ability of a man to make good in the Navy, the O'Rourke General Classification Test, prepared and standardized by Dr. L. J. O'Rourke, now director of research of the U. S. Civil Service Commission, was put into use.

Five hundred men who had deserted and been apprehended were first tested, and also 2,000 recruits. The scores of the deserters ranged consistently lower than those of the recruits in general. They showed that if men who made a score lower than 30 on the test were not allowed to enlist, 22 per cent. of the deserters would be eliminated, and only a comparatively small percentage of men who might make good would be excluded. Further applications of the test confirmed the relation between low scores on this particular test and the likelihood of delinquencies and failure in naval life.

It was also found that men who had gone farther in school were more likely to make good in the Navy than men who had poorer educations. This is not surprising, Commander Cummings points out, considering that enlisted men are called upon to perform highly technical work, such as aligning turret guns, figuring ballistic corrections, handling radio communications and materials, and innumerable other things requiring greater intelligence, initiative, responsibility and education than was required of sailors in former days.

Tests on recruits during the past year designed to show more definitely the relationship between delinquency and intelligence have not progressed very fast, owing to the fact that desertions and courts martial have decreased so greatly.

DANGERS OF SUNSTROKE

IT is time to keep on the safe and shady side of the street when the mercury begins to crawl up above ninety. Speech disturbances, hallucinations and paralysis are some of the things a victim of sunstroke may wake up to, if he recovers at all, according to Drs. E. G. Wakefield and W. W. Hall, of the U. S. Naval Medical Corps, who have recently completed a study of heat injuries. Even after these unpleasant manifestations have worn off and the patient has recovered he may remain hypersensitive to heat throughout his life.

Heat-stroke or sunstroke is one of the oldest known diseases according to medical authorities. Two cases are unmistakably described in the Bible, one in the fourth book of Kings and the other in the apocryphal book of Judith. Until the middle of the nineteenth century the effects of heat injuries were confounded with apoplexy. From the time of the publication in 1858 of the experimental work by the great French biologist, Claude Bernard, on the effect of heat, however, the theory of the disease has been based on experimental observation.

Drs. Wakefield and Hall are engaged in research on this vital problem of hot weather from which they hope to obtain results which will elucidate further just why people succumb to sunstroke.

The contention that people from cold countries are more susceptible than those from warmer regions is borne out by data obtained by the Navy doctors from the number of heat injuries sustained by enlisted men in the fiscal years 1924 to 1926. In a report of their investigation to the American Medical Association they assert that 121 men from northern states were afflicted in this period while only 89 southerners were affected by the heat during the same time.

ITEMS

THE well-known agricultural principle, that better plants grow from large seeds than from small, has been tested out in forestry with promising results, according to E. N. Munns, chief of the office of forest experiment stations of the U. S. Forest Service. In various tests with important western forest trees such as the California sugar pine, western yellow pine and the Douglas fir, it has been found that the largest seeds sown do produce the largest seedlings. When these seedlings are transplanted, however, either from one nursery bed to a more commodious one or to the forest, those grown from large seed slow down in their growth more than the others. At the end of a year or two in the transplant beds, or in the forest, the lead taken by the seedlings produced from the large seeds has disappeared. W. G. Whalenburg, of the Northern Rocky Mountain Forest Experiment Station, who has been making a study of the subject, states that this is due to the fact that the roots of the larger trees are injured when torn from the soil or are more severely pruned at the time of transplanting than are those of the smaller trees. Thus if the larger seed is to produce the larger tree it must be sown not in a nursery bed but in the forest where the tree is to grow permanently.

THOUSANDS of boys and girls on organized playgrounds in some 800 American cities are expected to compete this summer in a national model airplane construction and flying contest sponsored by a committee headed by Orville Wright, airplane pioneer. The recent achievements of aviation, particularly the Lindbergh flight, inspired this competition which will be conducted by the Playground and Recreation Association of America. It will come to a climax at national finals to be held in Memphis in October. The contest was suggested by Dr. John H. Finley, educator and editor, as a means of interesting the youth of America in the scientific principles underlying aviation. The three federal air secretaries, F. Trubee Davison, of the War Department; Edward P. Warner, of the Navy, and William C. McCracken, of the Commerce Department, have accepted membership on the contest committee.