SCIENCE NEWS

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THE TREND IN FLYING MACHINES

FLYING machines with rotating wings will be superior to the conventional airplane as soon as their possibilities for high speed are practically developed, according to a prediction made by John B. Wheatley, aeronautical engineer of the National Advisory Committee for Aeronautics, at the annual meeting of the Society of Automotive Engineers.

The autogiro and the gyroplane are the two types of rotating-wing aircraft which, according to Mr. Wheatley's analysis, have the possibilities of becoming superior to the conventional type of fixed wing airplane now widely used. The reason for the pronounced possibility of the autogiro and the gyroplane is the inherent ability of their rotors or moving wings to attain their maximum lift-drag ratio at any desired forward speed.

The novel cyclogiro, with the paddle-wheel wings, is rated by Mr. Wheatley as being approximately equal in merit to the airplane, while the heliocopter is definitely inferior.

The autogiro is the best known of all rotating-wing aircraft. It was invented by Juan de la Cierva, and the American version of the autogiro, which has been flown extensively in this country, has been produced by Harold F. Pitcairn, working with the Spanish inventor.

The gyroplane is sponsored by E. Burke Wilford, of Philadelphia. The autogiro and the gyroplane present a very similar appearance with blades that rotate freely under the action of air forces about a vertical axis, replacing to a large extent the conventional wing of the airplane. Mr. Wheatley explains that the aerodynamical principles of the autogiro and gyroplane are practically identical and that their differences are largely structural.

"The low-speed control is superior to that of the airplane," Mr. Wheatley said in reference to the autogiro and the gyroplane. "The reliabilitty is equivalent to that of an airplane, and emergency landings will be easier. The low-speed performance is superior to that of an airplane. Airplane high speeds will probably be exceeded. Control system is as simple and easy to use as that of the airplane. First cost will be slightly higher, but maintenance and operating costs will be equivalent to that of airplane."

The rotating-wing type of machine is likely to be used by the private flyer and the unskilled pilot because of its increased safety and the smaller landing field required for it. Almost all the hazards encountered in flying an airplane are connected with the phenomenon of a gradual weakening of control as the flying speed approaches its minimum, he explained. As minimum speeds range from 50 to 75 m.p.h. an undesirable premium is placed upon piloting technic during landings and take-offs. A rotating-wing aircraft suffers very slightly from these handicaps because the relative velocity of the lifting surfaces to the air is independent of the translatory velocity of the machine and is always large, so that the angle of attack of the lifting surfaces is well below the burble point. The resultant performance of rotating-wing aircraft thus materially extends downward the low-speed phase of flight, lessening the piloting skill required for emergency landings and take-offs, and making the pilot more independent of meteorological conditions because at low speed a shorter visibility is required for the same degree of safety.

Intensive wind tunnel research on the gyroplane is being conducted by the National Advisory Committee for Aeronautics at its Langley Field laboratories. The possibilities of the gyroplane aerodynamic system have already been investigated and now a 10-foot diameter model of the rotor is the subject of experiments. The autogiro has already been given considerable attention by the National Advisory Committee for Aeronautics.

The cyclogiro, which Mr. Wheatley rates as being approximately equal in merit to the airplane, is of such recent origin that it has not yet been demonstrated at full scale. It consists of a fuselage of conventional form, supported in the air by power-driven paddle-wheel wings, one on each side, rotating about the lateral axis. The paddle-wheel rotors perform the functions of both the wings and the propeller of the conventional airplane.

ALUMINUM-COATED TELESCOPE MIRRORS

THE great 200-inch telescope now being planned at Pasadena will be coated with an aluminum layer of high reflecting power instead of the silver that has been the standard material for many decades. The process for making such high quality mirror surfaces has been sought a long time, but satisfactory results have been obtained only recently through the experiments of Dr. J. Strong, of the California Institute of Technology.

It is important to get the surface to be vapor plated really clean. What is clean enough for silver plating is by no means satisfactory for aluminum. Dr. Strong blasts off the final contamination by a bombardment with electrons and ions.

The next puzzle was to find a suitable way of getting the aluminum to go where it was required. This is done by melting the aluminum on a tungsten wire of just the right size and shape. If the wire is too fine the molten aluminum will dissolve it and burn out. The wire in the form of a helix is heated until the aluminum evaporates and deposits on cooler surfaces near-by. This requires that the process take place in a high vacuum.

Dr. Strong has coated many small mirrors for instruments at the Mount Wilson Observatory with great success. Aluminum has an enormous advantage in reflecting ultra-violet light. Silver and everything else so far used are very poor as reflectors in comparison. Because of silver's shortcomings, the reflecting type telescope was inefficient. Aluminum will reflect well all the light that gets through the atmosphere.

The aluminum coating can be "laundered." The aluminum surface develops an invisible coat of aluminum oxide which protects the metal without tarnishing like

silver. It can be washed over and over with soap and water. It is thus not only much better but much more durable than silver which is now commonly used.

The biggest mirror so far coated is the 36-inch reflector of the Lick Observatory. The coating was applied by Dr. Strong. It required a vacuum chamber big enough for several people to sit in. The chamber for the 200-inch diameter mirror (almost 17 feet across) will be gigantic by comparison but only technical difficulties are involved in its construction.

THE FERTILIZATION OF RABBIT EGGS IN VITRO

RABBITS, developed from eggs that were fertilized outside the mother's body and brought to birth in the body of a second mother rabbit, have been produced in the Harvard University laboratory of general physiology by Professor Gregory Pincus and E. V. Enzmann.

Each of the two litters of "ectofertilized" rabbits which Professor Pincus and Mr. Enzmann have succeeded in obtaining may in a sense be said to have had three fathers and two mothers, for in each case three male and two female rabbits were required for the process. In the strict biological sense, of course, the real mothers were the females that supplied the ova and the real fathers were the males that supplied the sperm; the others would rate more as auxiliary or foster parents.

To produce their "ectofertilized" rabbits, a female rabbit was mated with a male which had been rendered incapable of producing sex cells by a simple surgical operation. The mating act stimulated the first steps in the development of the ova, or female sex cells, which, however, still remained unfertilized.

Then the ova were removed from the mother rabbit's body and placed in a suitable fluid in a glass vessel. Sperm from a normal male rabbit was added, and allowed to remain with the ova until each one had received the fertilizing male cell. Certain changes observable under the microscope indicated to the watchers that this process had taken place.

In the meantime, the "foster-mother" rabbit had been prepared for her rôle by being mated with another male incapable of producing functional sex cells. Into her maternal tissues, thus stimulated to activity, the ova of the other rabbit, fertilized in a glass vessel with the sperm of a male she had never seen, were introduced. They developed, and in due time the young rabbits were brought forth.

In order to have a check on the correctness of their technique and to make sure that the second mother rabbit's own ova were not chance-fertilized by stray sperm-cells, rabbits of different breeds were used throughout, so that the coat color of the young ones would indicate their actual parentage. This was in both cases indubitably traceable to the ova and sperm cells in the glass vessel.

In reporting their work to the National Academy of Sciences, Professor Pincus and Mr. Enzmann comment, "We believe, therefore, that this is the first certain demonstration that mammalian eggs can be fertilized in vitro."

THE FORMATION OF BUTTRESSES ON CYPRESS TREES

CYPRESS buttresses, those curious wide outgrowths that develop around the bases of these water-dwelling trees, are formed only when air and water have a chance to act together on the wood-forming tissues. Cypress trees growing on permanently dry land, or with their roots permanently covered with deep water, are alike in not forming buttresses.

So state Professor Herman Kurz, of Florida State College, and Dr. Delzie Demaree, of Stanford University, in the current issue of *Ecology*. Professor Kurz has had unusual opportunity for observing cypresses in the vast swamp-forests of northern Florida, and Dr. Demaree has made a special study of the trees of the Reelfoot Lake region in northwestern Tennessee, where great areas of already existing forest were partly submerged by the great New Madrid earthquake of over a century ago.

Everywhere the story is the same. Where there is no standing water the cypresses form no buttresses. Where the water level is shallow and constant, the buttresses are low but very wide. Where the water level fluctuates considerably, buttresses of a more or less conical shape develop. An interesting variant of this latter condition was discovered by Professor Kurz in some moderately deep cypress lakes that went suddenly dry and then refilled, a season or two ago. Here the tree-trunks had buttresses twelve feet or more high, with "waists" in them, so that they resemble the bottles in which a familiar soft drink is sold.

The form and magnitude of the buttresses are directly proportional to the total time that the various buttress horizons are in contact with air and water. This relation is so clearly revealed by the buttress forms that their profiles may be used to interpret water depth and water level fluctuations of lakes in which cypresses grow.

Dr. Demaree found convincing evidence that buttresses are not necessarily formed around roots, when the water level of Reelfoot Lake sank far below normal during recently droughty summers. The trees growing in this lake, which date back to before the great earthquake subsidence, have formed typical buttresses far up their trunks, which were left hanging high and dry by the lowering of the lake level. He terms this type "bell buttresses."

Cypress "knees," conical spongy-wooded upgrowths on the trees' roots, are formed as the buttresses are formed, only where air and water work together, the two botanists state. Botanists hitherto have considered knees as organs of aeration. Professor Kurz and Dr. Demaree, on the contrary, consider these outgrowths as responses to air and water. They never appear on the roots of dry-land cypresses, and never on cypress roots immersed permanently in deep water.

SCIENCE AND HUMAN WELFARE

SCIENCE, under controversy in many quarters as a prime contributor to the present disturbed condition of

the world, was pointed out as a possible and even necessary contributor to world recovery and further progress, by Dr. John C. Merriam, who spoke recently before the American Philosophical Society. Like the long-discussed conflict of science and religion, according to Dr. Merriam, the assumed clash between natural science and social science is possible only when there is interference with normal exchange of ideas.

Much of Dr. Merriam's address was concerned with the problems of conservation, and the ways in which science can come to the aid of economic reconstruction and sound long-time planning for future generations. Natural resources of the irreplaceable type, like oil and minerals, hitherto recklessly and wastefullly exploited as they have been discovered, largely by chance, can be much more wisely administered if the extent and availability of their deposits are mapped out by scientific surveys, and if science is further invoked in working out methods for their most efficient use. Resources that renew themselves in humanly measurable time, like timber and game animals, are even more susceptible to proper scientific management.

But conservation can serve more than man's bread-needs alone. Dr. Merriam pointed out the possible services of science in the preservation or restoration of natural areas fitted for esthetic enjoyment, educational development, and even religious contemplation. The national parks of America and the great temple groves of China were indicated as already existing examples.

Finally, the speaker suggested that science must contribute its share toward answering the difficult question of what things, both in the material world and in the domain of social relations, must be adhered to as that which is good and therefore to be defended against tendencies of change, and what things are legitimately subject to further evolution, whether through the ordinary processes of nature or through the hastening aid of man.

ITEMS

ARTIFICIAL radioactivity has been produced at Cavendish Laboratory in Cambridge by bombarding graphite with high velocity protons. This man-made radioactivity confirms and extends the work of F. Joliot and Irene Curie-Joliot in Paris who a few weeks ago discovered artificial radioactivity. Drs. J. D. Cockcroft, C. W. Gilbert and E. T. S. Walton speeded the hydrogen nuclei or protons to a high velocity with the same 600,000-volt tube that has previously performed important atomic transmutations. Positrons or positive electrons were produced. The new radio element produced lost half its activity in ten minutes. It is believed that the radioactive element formed in nitrogen of mass 13 is created by the addition of a proton to the ordinary carbon mass 12 of the graphite. A report is being published in *Nature*.

PREDICTION of earthquakes a few hours before they occur may be possible in the future as a result of studies that have been made in Japan, according to Captain N. H. Heck, chief of the Division of Terrestrial Magnetism and Seismology of the U. S. Coast and Geodetic Survey, in an address before the Brooklyn Academy of Arts and Sciences. In a number of earthquakes there was perceptible tilt of the ground several hours before the earthquake, Captain Heck said. In one case the villagers observing the tilt, feared a tidal wave and took to the hills. The tidal wave and earthquake came later. A new machine for measuring tilt of the ground has been invented by George E. Merritt, formerly of the U. S. Bureau of Standards, and installed in California through the cooperation of the U. S. Coast and Geodetic Survey and the University of California. This apparatus is expected to throw new light on earthquake problems in California. Tilt on a large scale and the creep of the earth's crust, known to be a factor in earthquake production, can be detected through triangulation and leveling, such as being undertaken by the Coast and Geodetic Survey. Prediction of earthquakes, however, lies in the future, according to Captain Heck. We now have, he said, no possibility of prediction beyond indicating whether or not a certain region is likely to have an earthquake in the not too distant future.

FOUR or five thousand years before the Children of Israel came seeking their Promised Land, Palestine had a dry climate and was mainly desert. Earlier, in the Aurignacian period of the Old Stone Age, the Palestine landscape was wooded, though gradually developing open spaces. Still earlier, in the latter part of the Mousterian period—the age of the uncouth, clumsy Neanderthal men—the land of Palestine was heavily wooded, due to heavy rainfall. In the first part of the Mousterian, Palestine was a warm and pleasant land with large rivers and hills clad with forest. These suggestions are made by Miss Dorothy Garrod, British anthropologist, and Theodore McCown, of Berkeley, California, as a result of their examinations of deposits they excavated as members of the joint expedition to the neighborhood of Mount Carmel from the American School of Prehistoric Studies and the British School of Archeology in Jerusalem. In the deposits of the Mousterian period they found fossils of rhinoceros, hippopotamus, crocodile and wart-hog, indicating that the climate was subtropical or tropical. Fossils of other species, such as deer, suggested the topography.

EFFORTS are being made in Germany to build up a supplementary herd of wisent, or European bison, almost exterminated as a result of the war, by an interesting technique called "Verdrängungszucht," or "suppression breeding." Surplus wisent bulls have been bred to American bison cows. Only female calves are kept, and these are bred back to wisent sires, each generation thus getting rid of half the remaining bison blood, until finally a stock of practically pure wisent will remain. This experiment is being carried on at the reserve at Springe, but it is expected that the herd will soon be transferred to roomier pastures in Brandenburg.

THANKS to systematic protection of wild life, Sweden has now at least 40,000 moose, whereas a decade ago there was grave danger of their extinction. Last year 6,335 were shot during the four days' open season, as compared with 5,740 the year before and only 381 ten years ago. Poachers get about 600, Government Forester Torsten Wennmark estimates.