SCIENCE NEWS

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BLIND LANDING FOR AIRPLANES

EXTREMELY difficult is the decision facing the committee of the National Academy of Sciences assigned to select a standard American system of blind landing for airplanes. In the interests of economy, efficiency and national defense, President Roosevelt has asked the academy for this decision.

This committee, as yet unselected, must choose from at least seven different blind landing systems which have been developed since Major James H. Doolittle, ten years ago, made the first blind instrument landing at Mitchell Field, L. I. The seven systems which have gone beyond the paper stage of development into actual airport installations include those of Air Track, Army, Bendix, I.T.D., Lorentz, M.I.T.-Metcalf and the Navy. The committee will examine impartially the claims, merits and tried performance of these systems and others and recommend accordingly. The fundamental question is whether it is wise now, after only the relative short time of ten years of development, to standardize on any one blind landing system.

The first of serious attempts to land an airplane with instrumental aid alone was that of the National Bureau of Standards in Washington in 1928. This method used a radio range beacon signal to mark the line of the runway and a marker radio beacon at the end of the field for longitudinal guidance. It was this system that Lieutenant Doolittle used in making the first successful blind landing in 1929. Later in 1929, at College Park Airport, Md., a glide path was added to the system by radio beams which provided the pilot with a positive and continuous indication of his vertical and lateral position. The marker beacons at the end of the airport gave indication of longitudinal position. The first landing on the complete system was made by M. S. Boggs on September 5, 1931. This was followed early in 1933 by landings at Newark.

Following publication of the Bureau of Standards work, the Lorentz Company in Germany developed a commercial system along similar lines. This system is in operation at several European airports and was tested at Indianapolis in 1937. During 1932 and 1933, the U. S. Army developed its own system of blind landing, which involved the use of a sensitive altimeter to give indication of the height above the ground. This system was quite easy to fly and required only a short pilot-training period, but failed to interest commercial aviation greatly because of lack of a finite course down the runway.

Essentially all the systems, with the exception of the Dingle system backed by the Navy, utilize very short radio waves to obtain sharp directional signals. The Navy in contrast employs very long wave-lengths. Standard practise is to detect with instruments in the plane the line of equal signal intensity between two directional radio beams. If the beams originate on a landing field, the equal-intensity line will furnish the pilot with the line of the runway. In the Army's newer system the direction is determined by direction finders on two radio stations.

COLOR VISION

THE first explanation of the chemistry underlying color vision in an animal was reported at the Lake Placid meeting of the Optical Society of America by Dr. George Wald, of the Harvard University Biological Laboratories. Dr. Wald has isolated and identified three color pigments found in the cones of the chicken eye, the color-seeing receptors. These pigments, he said, probably act as color filters in much the same sort of arrangement used to take color photographs.

The pigments are astacene, which is responsible for the color of boiled lobsters; xanthophyll, the pigment of egg yolk, and a carotene, a pigment giving carrots their characteristic color. The color "film" of the chicken eye, on which the filtered light falls to start the seeing process, contains a violet, light-sensitive pigment which Dr. Wald has named iodopsin. It is the first light-sensitive pigment ever found in the cones of the eye.

Dr. Wald, winner of this year's Eli Lilly prize of the American Chemical Society for his outstanding research on the chemistry of vision, gave his explanation of chickens' color vision during a paper in which he massed experimental evidence to prove that many of the complicated phenomena of seeing, a process involving man's highest mental powers, can be explained on a basis of relatively simple chemical and physical reactions which take place in the eye. More and more, he said, scientists are learning that many of the properties of vision are derived directly from the properties of various substances in the retina of the eye, the photographic plate on which images of the outside world are formed. As an example Dr. Wald reported the direct chemical analysis of retinas which show that rhodopsin, a rose-colored, light-sensitive pigment found in the rods, is manufactured by the body from two different precursors, either retinene or vitamin A.

This discovery has afforded a physico-chemical explanation of varying rates of the adaptation of the eye to darkness, for the synthesis from retinene is much more than that from vitamin A and the speed of the adaptation depends entirely on which precursor is being used. It also explains why a deficiency of vitamin A results in night-blindness, the inability to see in dim light, he reported. Without the vitamin there just isn't enough rhodopsin being formed.

In studies of experimentally induced night-blindness in human subjects, conducted by Dr. Selig Hecht and his colleagues at Columbia University and Dr. Wald, it was found that not only the rods but also the cones of the eye are affected by a faulty diet, a discovery which implies that vitamin A may be the precursor of the light-sensitive material of the cones as well as of rhodopsin.

Dr. Wald has found that visual sensitivity may decrease markedly within 24 hours on a vitamin-deficient diet. It

can be cured, however, in as short a time as 20 minutes with a single dose of vitamin A or the provitamin, carotene.

ATOMIC ENERGY OF URANIUM UNDER NEUTRON BOMBARDMENT

FROM eight pounds of uranium enough atomic energy can be released by neutron bombardment to drive a giant ocean liner like the *Queen Mary* across the Atlantic.

This calculation, showing the potency of atomic energy in contrast to fuel oil used by the Atlantic liners, can be made on the basis of new experiments just reported to the American Physical Society by Dr. Malcolm C. Henderson, of Princeton University, who has measured the heating effect of the atomic energy in uranium splitting by neutrons.

Dr. Henderson exposed 13 grams of metallic uranium to intense beams of slow neutrons generated at the great cyclotron of the University of California. Inside the uranium sample he placed a resistance thermocouple and measured the rise in temperature. From this he found that each uranium atom being split liberates 175,000,000 electron volts of energy.

From this figure calculations show that, if uranium energy could be applied:

1. Eight pounds of uranium would drive the *Queen Mary* across the Atlantic, as a substitute for the 6,300 tons of fuel oil her bunkers now carry.

2. Splitting 155,000,000,000 uranium atoms would warm one gram of water one degree Centigrade.

3. Only a little over a half-pound of uranium would warm a ton of water to 3,860,000 degrees Centigrade; or convert 386,000 tons of ice water into boiling water.

GIANT PROPELLERS

THE world's largest propellers for airplanes, designed for the super-giants of the air, are now being made at the Riverdale, Md., laboratories of the Engineering and Research Corporation. Unique are these newest blades, for they are of composite structure and contain light wood, hard wood, plastics and metal. Fed E. Weick, chief engineer of the Engineering and Research Corporation, described the new propellers at the meeting of the Washington Section of the Society of Automotive Engineers.

The largest blades yet made by the composite process measure 17.5 feet from tip to tip, but engineers see no size limitation to the method. The large propellers of the Pan American "clippers," now flying the Atlantic, measure 14 feet. The new composite blades are easily produced, are 33 per cent. lighter than comparable metal propellers, are strong and have low cost. The blades consist of a core of laminated light wood which merges into a root of impregnated and compressed hard wood. This, in turn, is threaded into a controllable pitch propeller hub. The whole blade is covered with a heavy coating of reenforced plastic and the leading edge is protected by a flush strip of metal.

As aeronautical engineers have sought to get greater and greater power for airplanes they have been forced to go to larger propellers, for the greater the power the greater must be propeller diameter to retain equal efficiencies. While much progress has been made in speeding up engines so that they turn over more rapidly, there is a limit in this direction, for the propeller tip must not move at speeds comparable with those of sound, about 740 miles per hour. Interest in lighter propellers comes because as the size of a propeller increases its weight goes up faster in proportion than does the power it will deliver. This gives a light but strong propeller a sizable edge in utility.

THE INVENTION OF A THERMAL PUMP

AN ingenious "pump" that can compress gases, create vacuums or transfer heat against its normal direction of flow and thus be useful as a refrigerating mechanism, has been invented by the president of the Carnegie Institution of Washington, Dr. Vannevar Bush. A patent just issued (No. 2,175,376) describes the new apparatus which Dr. Bush developed while at the Massachusetts Institute of Technology in collaboration with Edwin L. Rose, chief engineer of the Waterbury Tool Company.

In contrast to other devices doing a similar job, Dr. Bush's machine uses not mechanical energy but heat energy to accomplish its "pumping" of either gas or heat. Patent rights have been assigned to the Research Corporation, non-profit corporation of New York City, founded to control the proper exploitation of important scientific discoveries.

When used to compress a gas, or transfer heat from a lower to a higher temperature, a substantially constant volume of gas is alternately heated and cooled, thereby alternately raising and lowering its pressure, says the patent.

"In the case of a compressor," continues the patent, "these fluctuations in pressure are utilized to effect the transfer of gas between two regions of different pressure by admitting gas to the system from a region of low pressure when the pressure is low and ejecting gas from the system to a region of high pressure when the pressure is high. In the case of the thermal pump, the fluctuations in pressure are utilized to effect corresponding fluctuations in pressure in another but communicating body of gas from which heat is ejected to a region of high thermal potential when the pressure is raised and which is caused to absorb heat from a region of low thermal potential when the pressure is lowered."

Heating of the working substance (a gas) is accomplished by a small burning flame. The system contains a blower to make the working substance flow in the proper directions at the proper times, but the patent emphasizes that this blower is used only to control the thermal cycle and does not do mechanical work in compression.—ROBERT D. POTTER.

FOLSOM MAN

TWO decorated beads worn by Folsom Man or his wife are new evidence that America was no savage, uncouth place at the end of the Ice Age.

The bone "costume jewelry" is among discoveries re-

ported by Dr. Frank H. H. Roberts, Jr., of the Bureau of American Ethnology, who has returned from excavating at the earliest American home yet found—a camp site of Folsom hunters near Fort Collins, Colo.

It is becoming clear, according to Dr. Roberts, that America's earliest known culture must have compared favorably with Europe's Stone Age cave society existing at the same time. Geologists who have studied Folsom Man's only known home pronounce the relics to be as old as the last glacial period in America, usually timed from 12,000 to 25,000 years ago.

Folsom hunters, so-called because their favorite and peculiar stone dart-points first came to light at Folsom, N. Mex., followed big game such as mammoth and bison. But far from spending all their time roving like savages and eating just to live, these early pioneers had home and community life. They enjoyed artistic decorations as shown by the beads, and also by the red and yellow paint found by Dr. Roberts.

They made the beads of long bones of some small animal, smoothing the rough edges and marking simple patterned lines on the surface. Their specialty in stone was the grooved Folsom point, beautifully made, but Dr. Roberts has unearthed a variety of tools and weapons which they contrived, including some new knives and scrapers first discovered this year.—EMILY C. DAVIS.

THE TREATMENT OF DETACHED RETINA

ELECTRICAL spot-welding in the eye for restoring sight to patients threatened with blindness due to a detached retina was stated by Dr. Samuel J. Meyer, of Chicago, at the Philadelphia meeting of the American College of Surgeons, to be effective in a number of cases.

The retina is the light-sensitive part of the eye which transmits images to the brain through the optic nerve. It may be compared to the photographic film or plate in a camera. It depends for its nourishment on tissue called the choroid. When, because of injury or disease, it becomes detached from the choroid, it can not function properly and the patient feels as if a curtain were falling over part of his eyes. If not treated, the retina as a rule will eventually all peel off the choroid, like wallpaper off a wall, and total blindness results. Modern eye surgeons treat this condition by a kind of electrical spot-welding. Tiny needles carrying an electric current are applied to the choroid without puncturing it. The electric cauterization produces an adhesive inflammation between the choroid and the retina, causing the retina to become reattached.

This method is only 11 years old, but increasingly good results are obtained. More than one out of three patients operated on at the Illinois Eye and Ear Infirmary since 1934 had reattached retinas with vision ranging from normal to one tenth normal.

ITEMS

THE skull of an evolutionary link between reptiles and mammals, that lived in South Africa many millions of years ago, has been studied in detail at the Walker Museum of the University of Chicago by the Reverend Harold W. Rigney, missionary-scientist now stationed at Accra, Gold Coast, West Africa. The animal, known to geologists as *Galesaurus planiceps,* belonged to the extinct order called cynodonts—the name means "dog-tooth." Although unquestionably reptiles, cynodonts resemble primitive mammals in some details of skull structure.

THE strangest fluid in the world might well be the title for liquid helium, which turns from a gas to a liquid only at the temperature of a few degrees above absolute zero. Dr. J. O. Wilhelm, low temperature expert of the University of Toronto, says that liquid helium, for equal volumes, weighs only one seventh as much as water. It has the ability to conduct heat as well as metallic copper, and it is so lacking in viscosity that it can be regarded as a gas.

AMERICAN corn fields potentially can produce fibers with wool-like properties, it appears from research reported by L. C. Swallen, chemist of the Corn Products Refining Co., at Argo, Ill. From a bushel of corn a pound of zein, a by-product of corn processing, can be obtained. Zein is a protein with uses, in many cases, like those of casein derived from cow's milk. It can be made into plastics, into water-proof wrappers, quick-drying printing inks and into films and fibers.

BOTANISTS and biochemists of the University of California have discovered in the juice of milkweed an active substance that can tenderize meat as successfully as can papain, extracted from the tropical plants, papaya, now used on a large scale for the purpose. The quantity of the new-found substance is small, but it is believed that large-scale and intensive cultivation of the plant might make its production profitable. At present, papaya imports amount to half a million pounds a year, costing several million dollars. The active principle of the milkweed has been named asclepain, from the botanical name of the plant, Asclepias, by analogy with the formation of the word papain from the plant name Papaya.

A NEW and simplified electron microscope, suitable for use in research institutions, was perfected in Germany by the great electrical firm Siemens and Halske A. G. shortly before the outbreak of war. Earlier models of this instrument, which uses streams of electrons in a vacuum tube to make visible minute structures and details not detectable by any microscope using beams of light, required the services of technicians specially trained in the handling of high vacuum and electrical instruments, which made operation too expensive for most research purposes. The new instrument obviates the necessity for these extra attendants.

THAT ultra-violet radiation, deadly to cells if administered in certain doses, proves a stimulant to growth in the same kind of cells if given in doses of two thirds the lethal magnitude, has been demonstrated in experiments at the Smithsonian Institution, performed by Dr. Florence E. Meier. Dr. Meier used cultures of the one-celled alga or water plant, *Stichococcus bacillaris.* Some were rayed, others were left unrayed, as controls. The cultures that were given the stimulative raying not only showed the response in their own generation but passed on the habit of rapid cell-multiplication to their descendants for many generations.