SCIENCE NEWS

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IMPROVED INCUBATORS

THE hen's efficiency in hatching eggs may at last be rivaled by the incubator, if work of a British electrical engineer, Llewelyn B. Atkinson, can be applied in commercial hatcheries. Mr. Atkinson believes that the missing link in modern incubation methods is that the eggs are heated too nearly alike on both sides. In the hen's nest there is from 14 to 20 degrees difference between the top of the egg, which is close to the hen's body, and the lower surface of the egg. With this apparently shiftless method of protecting the eggs, a setting hen hatches about 90 per cent. of her chicks, if she is ordinarily responsible and doesn't leave the nest or break the eggs.

Designers of modern incubators attempted to improve on the hen's system by heating the eggs about the same all over. Incubators sometimes make as high an efficiency record as that of the mother hen, but 60 per cent. is said by poultry experts to be average.

In the British experiment a thin sheet of india-rubber was placed like a blanket over the eggs. Mr. Atkinson reports: "This method produced very remarkable results. In an incubator which has rarely given above 55 per cent. of the eggs placed in it, this percentage was raised to over 95 per cent. of the fertile eggs."

Dr. M. A. Jull, poultry expert of the U. S. Department of Agriculture, says that the Atkinson experiments may have great significance to the American poultry business. Half a million or a million chicks are hatched each year in some of the mammoth commercial hatcheries in this country, and the baby chick crop turned out by American incubators probably exceeds 100,000,000. A 40 per cent. increase in efficiency would mean millions of dollars to the industry.

"One of the big factors of cost in the poultry business is the mortality of baby chicks," said Dr. Jull. "The results of Atkinson's experiments should be checked and tests made to determine their practical application."

PLANS FOR A GIANT WINDMILL

ANTON FLETTNER, the German inventor of the rotor ship, is planning a gigantic windmill designed on aerodynamical principles which will be some 300 feet in diameter mounted on a tower 650 feet high, higher than the Washington Monument and nearly as tall as the Woolworth Building.

This immense structure for obtaining power from the wind will not make use of the Flettner rotating cylinders, such as used on the rotor ships, but will have two large wings or propeller blades so constructed that they will obtain the most out of the moving air, according to the reports that have reached New York recently.

The famous Flettner rudder which is used in steering both ships and airplanes will be used to keep the propellers at the most efficient angle for the particular wind velocity. The cross-sections of the wings will resemble those used on airplanes and they will be designed so as to decrease to a minimum the air pressure on the rear side of the driving wing.

The proposed windmill is striking in size, but it is also unique in the method of generating power. Instead of having the large wheel geared to a single electric generator, it is planned to mount a small high-speed windmill on the tip of each propeller arm. These auxiliary windmills will actually generate the power by driving directly generators. Flettner claims that the rotation of the large wheel will multiply the velocity of the small windmills ten times and that this will aid in the regulation of the voltage of the electric current obtained.

The huge structure that would support the 300-foot propellers presents a very difficult engineering problem and it is a problem of major design to make the windmill wheel itself structurally safe and strong. The reason for such a high tower is said to be that the winds are steadier at such heights.

No estimates of cost are contained in the information published in Germany, nor is it indicated whether actual construction of the windmill is contemplated.

THE STARS IN THE SPRING

SPRING began in the northern hemisphere on Friday, March 20, at 10:13 P. M., Eastern Standard Time, when the sun crosses the equator coming north. The sun will then be almost exactly in the zenith at a point in the East Indies where it will be noon at that instant. The dividing line between day and night will then pass through the north and south poles of the earth, and day and night will be equal in length all over the globe. As a result of refraction, however, the sun is elevated above the horizon by about a half a degree before it has actually risen and lingers in view for an equal period after it has actually set and the day is lengthened at the expense of the night. So, strictly speaking, day and night are not exactly equal in length when the sun is at the vernal equinox, at the beginning of spring, or six months later, when it is at the autumnal equinox, going south in September.

This effect of refraction upon the times of sunrise and sunset is most noticeable within the Arctic Circle where the sun is below the horizon for months at a time and where, when it does put in its appearance, it remains above the horizon for equally long periods. At the north pole, for instance, where the sun should make its first appearance on March 20, at the beginning of spring, it actually appears three days earlier as a result of refraction. For the same reason it remains above the horizon for three days after it has passed through the autumnal equinox in the fall when, theoretically, it should disappear from view for six months. This adds

in all, then, six days of much desired sunlight to the long polar day at the expense of the polar night. At other points within the Arctic Circle the sun will make its first appearance before it reaches the vernal equinox, how much before depending upon how distant the place is from the pole. The greater the distance from the pole the sooner the sun will appear.

The equinoxes, vernal and autumnal, are the two points of intersection of the ecliptic, the apparent yearly path of the sun through the heavens, with the celestial equator, which lies directly above the earth's equator. The name equinoxes, meaning equal nights, comes from the fact that when the sun is at either of these points the line of division between day and night passes through the poles and the two periods are equal in length.

The equinoxes, as it is quite generally known, are not fixed points in the heavens but are gradually shifting westward along the ecliptic. This westward motion of the equinoxes is called the Precession of the Equinoxes and it amounts to about thirty degrees in two thousand years, a complete circuit of the heavens along the ecliptic in 25,800 years. An attendant effect of the precession is the revolution of the north pole of the heavens around the north pole of the ecliptic in the same period at a distance from it of 23.5 degrees. It follows from this that the pole-star is not always the same during this period. Two thousand years ago our present pole-star, Polaris, was twelve degrees from the north pole of the heavens. It is now a little over a degree away. Its distance from the pole will decrease for the next two hundred years until it is within half a degree of the pole; then the distance will increase once more. About twelve thousand years from now the magnificent Vega will be the pole-star.

The vernal equinox, where the sun is at the beginning of spring, is now in the constellation of Pisces. Two thousand years ago it was in the constellation of Aries next to Pisces on the east. It then acquired its name of "First Point of Aries," which it still retains. Sometimes the vernal equinox is also referred to as the Greenwich of the celestial sphere because the great circle of the heavens that passes through the vernal equinox and the north and south pole of the heavens is analogous to the prime meridian that passes through Greenwich. The right ascensions of the stars are reckoned from this prime meridian of the heavens just as longitudes are reckoned from the prime meridian of Greenwich. It is Greenwich mean noon when the sun is on the meridian of Greenwich and it is sidereal noon when the vernal equinox is on the meridian. The length of the tropical year—which is our ordinary calendar year—is determined by the time it takes the sun to pass from the vernal equinox in the spring back to the same position in the following spring.—*Isabel M. Lewis.*

"INVISIBLE LIGHT"

MUCH as man prides himself on his ability to see, his eyes are sensitive to only a very small portion of the "light" or ether vibrations constantly flooding the world.

For this reason reports from India that a scientist there has devised a "super-retina" of "invisible light" have not created great interest in American scientific circles.

As "super-retinas" science now has in successful operation photographic plates, X-ray screens, thermometers, radio receivers and electrical instruments to receive and record "invisible light" in the form of ultra-violet and infra-red rays, X-rays, heat waves, radio and electrical waves.

Stretching on both sides of the small portion of the spectrum that can be seen by human eyes are great ranges of ether vibrations that, while invisible, vitally affect man and his work.

Visible light, ranging from the deep violet with a wave-length of 16 millionths of an inch to deep red with a wave-length of 28 millionths of an inch, occupies only an octave of the spectrum of ether vibrations. Our eyes tell us what materials are opaque and translucent to visible light.

Shorter than visible light are the ultra-violet rays with wave-lengths from a millionth to 16 millionths of an inch. These rays affect photographic plates markedly and, in fact, much of the image in ordinary negatives is due to these rays which can not be seen by the eye. They have also been found to affect the growth and health of man, animals and plants. The sun's radiation is rich in these rays and light from mercury vapor lamps in fused quartz containers contains much of these wave-lengths. Most materials opaque to visible light are also barriers to ultra-violet light, yet ordinary window glass will not let it through. The minerals fluorspar, quartz and rock salt are transparent to ultra-violet. These rays also have the property of making some substances, finger nails for instance, glow with visible light.

The shortest waves known to man are the gamma rays of radium, given off when this wonderful chemical element spontaneously disintegrates. These are even shorter than the hard X-rays used medically in the treatment of cancers and tumors and in scientific work. Rays from radium and the X-rays created when cathode rays impinge on solid objects are very penetrating, passing through skin and flesh and many other substances. By allowing them to strike fluorescent screens they can be made visible to the eye and they can also be permanently recorded on photographic plates.

Between the ultra-violet rays affecting photographic plates and the X-rays lies a zone of ether waves but recently explored and little is known about them.

On the long wave side of visible light are the infra-red or heat waves. Many substances, such as water, easily penetrated by visible light are relatively opaque to infra-red rays and most of the hydrocarbons stop these wave lengths that range from 16 millionths to 12 thousandths of an inch. Thermometers record this sort of radiation and photographic plates specially treated with red-sensitive dyes can also be made to permanently record the infra-red.

Still longer than the infra-red rays are the Hertzian or radio waves used in wireless communication and

broadcasting. These are received by wire and coils and may be rectified in such a way that they produce audible sound waves when conducted into telephone receivers. They range in length from a few meters or yards to many thousand meters or several miles.

The longest waves in the spectrum are those of ordinary alternating current that pulsates relatively slowly. Such waves are often several thousand miles in length.

WILT RESISTING FLAX

THE boast of the old-time "bad man" that he was so hard-boiled that if a rattlesnake bit him it crawled away and died, seems to be made good in the plant world by the wilt-resistant variety of flax. For this disease-resistant plant actually seems to be able to poison the fungus of the wilt disease, that was rapidly wiping out the flax-growing industry of the northwest before the new variety was introduced, and the poison it uses is the one that experts in gas warfare dream about but can not perfect for their purposes—hydrocyanic or prussic acid.

The studies of Professor Ernest S. Reynolds, of the department of botany of the North Dakota Agricultural College, have shown the method of attack by the fungus and of resistance by the flax plant. Preliminary experiments showed that what the fungus wanted was sugar to eat. It had its preferences, too, for it was shown to thrive better on dextrose, or grape sugar, than on any other kind; and dextrose is the most abundant sugar in the flax plant. Next to dextrose it preferred sucrose, or common cane sugar, and then with diminishing zest, a number of other kinds of sugar.

To learn how the resistant flax defended itself against this enemy, Professor Reynolds grew cultures of the fungus, supplying them with various kinds of food and with extracts from both resistant and non-resistant flax plants. The fungus grew lustily on extract of non-resistant flax and it also grew well on extract of resistant flax that had been heated to sterilize it. But when extract of resistant flax that had been sterilized by passing through a fine filter without heating was supplied, the fungus growth was much depressed.

Professor Reynolds therefore concluded that there was some chemical compound in resistant flax that was poisonous to the fungus or that gave rise to a poison defense, and that it was good so long as it was not heated. This would indicate that it is an enzyme, for these compounds also are active until heated. Further work by Professor Reynolds showed that when a cell was crushed or penetrated, as by an attacking fungus thread, the enzyme was released, and acting upon certain organic chemical compounds present, generated hydrocyanic acid, which is a deadly poison; and this, naturally, brought the bandit fungus to a bad end.

THE CAUSE OF PELLAGRA

PELLAGRA, a disease of serious importance in the South, may be prevented by the newly-discovered "dietary factor P-P," present in brewers' yeast, fresh milk and fresh beef. While it may be a vitamin, it is not identical with any of the vitamins hitherto discovered and described. Drs. Joseph Goldberger and W. F. Tanner, of the United States Public Health Service, discovered this new disease-preventing factor while they were at work at the Georgia State Sanitarium for colored women, where many of the inmates were sufferers from pellagra.

Earlier investigators had made frequent statements that peas and beans were pellagra preventives but Drs. Goldberger and Tanner found that even when the patients were given these foods daily, in considerable amounts, pellagra still developed. Then they tried fresh milk casein in the form of cottage cheese and obtained good results. Dried milk powder, however, failed to have the same preventive power. The best results were obtained with brewers' yeast. Patients receiving daily doses improved more rapidly than those on any other treatment tried.

By comparison of the diets of their patients with those used in treatments and experiments on other deficiency diseases, Drs. Goldberger and Tanner were led to the conclusion that none of the known vitamins or dietary factors could account in every case for their results and that therefore there must be a hitherto unsuspected preventive factor at work.

ITEMS

A NEW kind of tarnish-resisting silver has been developed by a British silver manufacturing company. The material, which is 92.5 per cent. silver alloy, has been put to practical test by the manufacture of articles from it, and the results have been reported to the Silver Trade Technical Society. The new alloy is said to stand up to the heat necessary for soldering, and to keep shape while being heated. It will bear more heat than standard silver, and will allow of a considerable amount of manipulation without developing any defect. British housewives are following the experiments with interest in the hope that egg and fruit stained silverware will soon be problems of the past.

IN South Africa, where plagues of locusts are often fought with arsenic, it has been found that these insects, even though they have succumbed to deadly poison, can still be used safely for cattle food. Experts of the Department of Agriculture of the Union of South Africa have determined that in order to obtain a fatal dose of the poison cattle, sheep or horses would have to consume 200 to 700 pounds of the locusts, indicating that none of these animals are in danger from the poisoned insects. For poultry and pigs, however, there is not such a wide margin of safety.

SOME of our most beautiful ferns may fall under the ban which the government is placing on gooseberries and barberries, according to C. A. Weatherby, noted fern specialist. He reports that species of rust attacking balsam firs with destructive force are found to have ferns for their alternate hosts. Both eastern and western balsams are infected and ferns guilty of transmitting their disease are found on both coasts. Among them are the beech fern, the sensitive fern, the marsh fern, the western ladyferns, brackens and polypodies.