SCIENCE NEWS

Science Service, Washington, D. C.

NATURAL, CULTURE AND ARTIFICIAL PEARLS

TRUE pearls derive their origin from the accidental introduction of an irritating foreign substance into certain cell tissues of the pearl oyster or other pearl-bearing mollusc. This foreign substance—parasitic worm, watermite, grain of sand—which finds its way by accident into the tissues of the oyster becomes the nucleus of a natural pearl, the most prized and most valuable of the three classes. The cells of the oyster proceed at once to imprison the foreign substance, surrounding it with layer upon layer of nacreous material, of the same iridescent character as the inside shell of the oyster.

Since the discovery of the origin and growth of natural pearls, man has been striving to produce these results by artificial means, that is, to grow culture pearls. Simple as the process may seem, it was not until 1894 that Kokichi Mikimoto in Japan developed a satisfactory method for inducing the development of culture pearls. The success of this venture is attested to by the fact that he was able to produce an annual output valued at $600,000 in 1921.

Imitation pearls are a synthetic product manufactured in large quantities from pearl essence—a product derived from fish scales. Formerly the source of supply was a small Europeon minnow, the iridescent effect being discovered by accident by Jaquin, a French rosary maker, about 1656. Jaquin noted that the water in which the fish had been washed contained a highly lustrous substance which, when concentrated and applied to small globes of alabaster, produced remarkably good imitations of pearls. During the War, the European source of supply of fish scale essence or pearl essence was cut off. Experiments with the scales of native American fishes resulted in the development of an entirely new industry in this country. Some two million pounds of the scales of such fishes as our north Atlantic sea herring and river herring are used annually, the uses for fish scale essence are steadily increasing and the cost of producing excellent imitation pearls is decreasing. Large sheets of celluloid are also given a coating of imitation mother-of-pearl and used as backs for brushes and many other toilet articles.

But to return to the question of the means for distinguishing between the three classes of pearls under discussion, as pearl essence is usually applied as a thin coating, little difficulty will be experienced in ascertaining whether your possession is an imitation pearl. The celluloid coating can be cut or peeled off or dissolved off with amyl acetate or acetone.

As between culture pearls and natural pearls the problem of differentiation is a most difficult one. Yet, because of the difference in sales value, one buying a natural pearl wishes to assure himself that he is getting what he is paying for. In perfection of form and lustrous beauty there are no distinguishable differences. There is no chemical difference, the same cells of the oyster function after the same manner in producing a pearl. When the culture pearls began appearing there was considerable litigation in France and the courts concluded that culture pearls possessed all the specific characteristics of real pearls and their quality could not be questioned.

Since 1923, a small group of Japanese investigators acting on the suggestion of Professor Nakamura have been studying the problem, and have recently published the results of these investigations in the Proceedings of the Imperial Academy of Tokyo, Japan.

By the use of the X-rays they were able to distinguish between culture pearls and natural pearls. In the former, a perfectly spherical nucleus of shell is introduced into the oyster and around this the oyster builds the pearl. An examination of natural pearls, of culture pearls, and of the nuclei used in culture pearls by the expert in X-ray analysis and a comparison of the patterns produced for different orientations of the primary X-rays revealed valid differences between the two classes of pearls. It will undoubtedly be comforting to many to know that a method of differentiation has been evolved.—*Louis Radcliffe.*

THE DESIGN OF AIRPLANES

THERE is no "best" type of airplane, it all depends on what it is expected to do; and the plane should be as simple as possible, for then there are less chances for things to go wrong. This is the belief of the Honorable Edward P. Warner, assistant secretary of the Navy for aeronautics, and former professor of aeronautics at the Massachusetts Institute of Technology, expressed in an address in Philadelphia before the Franklin Institute.

"The quest for a universally applicable formula, for a hard and concrete statement of what is 'best' in design, has been persistent and unavailing. One of the many committees which has investigated the aeronautical activities of the government of the United States made a special effort to secure some sort of a 'yardstick' whereby statesmen comparatively uninstructed in the purely technical aspects of aviation could rate the merits of aircraft, but the effort was, and would be likely always to be, in vain.

"What is 'best' depends upon the end to be accomplished. Neither monoplane nor biplane has proved itself definitely and generally superior to the other. Machines with external bracing have neither driven from the field nor been overcome by those with the structure contained within the wings. Airplanes with one engine and those with two engines and those with more exist side by side."

In Mr. Warner's opinion, the design of airplanes is pretty well stabilized, and will probably not suffer any fundamental change for many years to come.

"It would not do to ignore or deny the possibility of invention producing a fundamental modification in the whole mode of operation of heavier-than-air craft," he

said, "but whatever happens the laws of aerodynamics will remain unchanged and will continue to govern the behavior of every machine that flies, however the details of its means of propulsion and of support might be changed.

"Anything may happen, but for myself I am not among those sanguine spirits who expect to see the airplane as we now know it displaced by some radically different machine capable of vertical ascent or descent, or other valuable novelties of performance. Such devices deserve the most serious consideration and examination and they may well prove of great usefulness in certain employments, but they are subject to fundamental difficulty in that they all involve some continuously moving parts within the structure. A rigid structure can be designed so that its chance of collapse is infinitesimal, but as soon as bearings and moving parts are introduced, even with the most careful design and the most watchful maintenance, there exists the chance for something to go wrong.

"If the upkeep is as slack as it is likely to become in the hands of the average private owner the chance is multiplied.

"To complicate the structure is to make the minimum conditions of safety less simple and sure, and it is because most of the proposals for radical modification in the fundamental method of operation of heavier-than-air craft are suggestions for increasing complication and for introducing new working parts that I view them as a whole with a considerable skepticism."

THE CHRONOTEINE CAMERA

FEEDING movie film through a camera at the rate of three miles a minute to slow down rapidly moving machinery to about one two-hundredth of its normal speed is the feat accomplished by C. Francis Jenkins, of Washington. At the meeting of the Society of Automotive Engineers in Detroit Mr. Jenkins told of the "chronoteine camera," one of his latest inventions, and how it may be applied to the study of automobile engines.

Instead of the sixteen pictures a second, taken by the ordinary movie camera, or the 128 taken by the "ultra-rapid" camera now frequently used in filming athletic events, the chronoteine takes 3,200 pictures a second at its normal rate. If desired, it can be speeded up even further, and take as many as 10,000 a second. When these are projected in the ordinary machine at the speed of 16 a second, the apparent speed of the motion is correspondingly reduced. When taken at 3,200 per second, the reduction of speed is 200 times, and at the higher speeds it is of course greater.

In the usual type of motion picture camera, the film is stopped for each exposure, so that it stops and starts sixteen times a second. At such high speeds as those employed in the chronoteine camera this is impossible, for the film would be torn to pieces. Therefore it is moved through in a steady stream.

A further difficulty is introduced, because with a single lens extremely short exposures would have to be made. Otherwise the picture would be blurred, just as if the object itself were close to the camera and moving at such a high speed. Mr. Jenkins has avoided this difficulty by providing 48 lenses, set in the periphery of a 13-inch disc, which turns at a speed of 4,000 revolutions per minute. The film moves back of one side of this disc, so that the images formed by the lenses move right along with the film. In fact, the exposures overlap, as the exposure is begun through one lens before that through the preceding lens is completed. At 3,200 exposures a second, each one is about one twenty-five-hundredth of a second in length. With the rapid lenses used, and sensitive film, this is easily sufficient for a fully timed negative in bright sunlight. In the ordinary movie camera, at 16 a second, each exposure is about one thirty-second of a second in duration.

Mr. Jenkins calls attention to the good photographic quality in the pictures, which is unusual in such high-speed studies. "The pictures are true photographic pictures having half-tone values like other motion pictures, not mere shadowy outlines of grayish silhouettes," he says. "They are made out of doors as well as in the laboratory, of large subjects or small subjects, and from a moving vehicle as readily as from a fixed platform.

"The chronoteine camera is an instrument for the study of many problems in science and engineering, some of which are not possible of accurate determination in any other way. Some additional applications of this instrument which immediately suggest themselves are a study of gun recoil, shell trajectories and plate impacts, airplane propellers and landing-gear action, bursting of balloons and air hose, tire action over obstructions, water streams, propagation of flame, engine-valve rebound at high speed, cam-roller jumping, crank-shaft whip; transformer explosions and circuit-breaker arcs; shuttle thread-knots and bobbin action, brake-shoe and draft-gear application, in fact, anything that moves too fast for the eye to follow can be shown slowed down and can be examined in detail at leisure and repeatedly."

THE MOSQUITO FISH

GAMBUSIA, the little fish that is such an enemy of "wigglers" that it has earned for itself the honorable title of Mosquito Fish, reverses the usual order of nature, in that the "gentler sex" is the male. The world's rude buffets kill off male mosquito fish as they grow up, until when a given brood arrives at maturity there are from two and one-half to eleven times as many females as there are males, although they started out in life in equal numbers. So states Dr. Samuel F. Hildebrand, director of the U. S. Fisheries Biological Station, who has been studying the survival rates of these little but economically and hygienically important fish. The sex ratios vary according to the season, being about 2.5 females to 1 male in June, and 11.3 females to 1 male in August.

The reasons for the higher death-rate among the young males have not been fully worked out, but it is suggested that inasmuch as they are considerably smaller than the females they fall easier prey to carnivorous fish. Moreover, the females themselves frequently attack and

kill the males, which seem to be too chivalrous or else too timid to bite back. Finally, experiments indicate that unfavorable environmental factors, such as lack of oxygen in the water, affect the males more severely than the females.

In spite of the predominance of females it is not believed that the breeding rate is held in check, for the fish are highly polygamous.

MUMMIES IN NEW MEXICO

THE discovery of some interesting mummies has been announced by Frank Pinkley, superintendent of southwestern monuments for the National Park Service. At the Aztec Ruin, in New Mexico, excavation work has been in progress for the purpose of getting daylight down into a row of prehistoric rooms being used for museum purposes. In the course of this work two child burials were taken from the floor, one with a very interesting black obsidian pendant, two decorated dippers, a mug and two dishes containing food. This mummy was first wrapped in feather cloth and then in matting, and in addition had beneath it a large reed screen and over it a large mat.

The body itself was wrapped as a large package and tied with yucca cord. The pendant had slipped from the package, and it is believed by George L. Boundey, custodian of the monument, who made the excavation, that there are other ornaments within the wrappings. He did not open them, however, as the whole is in such a good state of preservation and is an excellent museum exhibit.

The other child burial found at Aztec had with it an ax, a basket, a flat board, and about a pint of corn ears. One ear, of red corn and just as fresh looking as though from last year's crop, has about half the kernels still in place. Mr. Boundey states this is unlike any corn he ever saw before. In the hard dirt floor of the lower story of rooms in the ruin five soft breaks were noticed. One of these was partially dug out and disclosed some peculiarly carved sticks and three pots.

Montezuma Castle National Monument, in Arizona, also yielded a prehistoric infant burial, which has been added to the museum at that place. The child had been buried with eleven shell bracelets over one arm and a string of shell beads around the neck. This mummy was discovered by Mrs. Martin L. Jackson, wife of the custodian of Montezuma Castle. She also unearthed two fine fragments of lace or embroidered cloth.

ITEMS

THE general death rate of the industrial population of the United States and Canada for 1927 will probably be the lowest ever reported, according to figures already available from the records of the Metropolitan Life Insurance Company. The chief factor in bringing about this decrease is the drop in the influenza death rate to about half that of 1926, with an accompanying decline in pneumonia mortality. Deaths from tuberculosis probably will reach a new low level in 1927, it is stated, attaining a point that would have been regarded as nothing less than visionary as short a time as ten years ago. Whereas the rate was 224.6 deaths for every 100,000 of the company's policyholders in 1911, the indications are that for 1927 it will not exceed 90 per 100,000. The year just past, however, will show no decrease in the number of accidental deaths over the last three or four years. The rising toll of the automobile, the statisticians report, along with considerably more suicides and a small increase in homicides all combine to make the 1927 record of violent deaths decidedly depressing.

THE ability of a living diphtheria bacterium to pour poisons into the blood stream of humans bears a relation to the size of the charge of electricity which each bacterial cell carries, according to Drs. I. S. Falk, L. B. Jensen and J. H. Mills, of the University of Chicago. Their electrical measurements can be made in a few minutes and with simple apparatus on cultures thought to be capable of producing toxin. The results are obtained much more rapidly than by time-consuming methods of animal experimentation. The electrical method is based on the fact that the power of the bacterium to excrete poisons depends on the porosity of its outer wall. This, in turn, affects the electrical charge on the cell as a whole. The observation is made by placing the suspected organisms in a small chamber between metallic plates charged to a definite electrical potential. The rate at which the bacteria cross the electrical field is then watched through a microscope. The virulence of the germs can be calculated by reference to the rate of "migration" of a stream of diphtheria of known toxin-producing power. This new method is expected to speed up detection of cases of diphtheria, and to facilitate release from quarantine.

NEW light has been shed on the problem of getting the marten, an animal of the mink family whose skin is highly prized for fur, to produce offspring during captivity. Research conducted by Frank G. Ashbrook and Karl B. Hanson, of the U. S. Biological Survey, at a federal fur farm in the foothills of the Adirondacks indicates that contrary to general belief martens of opposite sex will live together in peace and harmony during most months of the year. The males, however, fight ferociously whenever they come in contact. The normal breeding season, Mr. Ashbrook declares in a report in a forthcoming issue of the *Journal of Heredity*, is late summer rather than during the winter as was previously supposed. The normal gestation period, moreover, may require as long as eight months instead of the two or three that naturalists have assumed in the past.

THE puncture vine, whose sharp-pointed burrs cause endless trouble to motorists in California, has made its appearance in Australia, it has just been learned. The Australian authorities are endeavoring to stamp it out by piling refuse on it and burning both vine and seeds. Botanists have given the vine the appropriate name *Tribulus terrestris*, which means "trouble of the earth." It is stated that its original home was in the Mediterranean region, but like many ill weeds it has become a great traveler.