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EDITED BY WATSON DAVIS

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EDWIN E. SLOSSON, Director
WATSON DAVIS, Managing Editor



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TO LAUNCH ZR-1 IN AUGUST

ZR-1, the all-American giant helium airship now ninety-nine per cent. complete, will be launched at Lakehurst, N. J., in August and used to test the commercial practicability of big lighter-than-air craft in this country according to Rear Admiral W. A. Moffett, chief of the U. S. Navy's Bureau of Aeronautics. On August 1 about three weeks of exhaustive structural testing of this leviathan of the skies were begun inside the hangar, after which a series of actual flight tests of progressively greater length will be undertaken preparatory to an air voyage to the North Pole early next year.

The helium to be used as the lifting power for the big dirigible is already on hand, and preparations for the official launching are rapidly going forward. Mrs. Edwin Denby, wife of the Secretary of the Navy, will christen the new ship.

Every precaution is being taken to insure the maximum possible safety and efficiency of the ZR-1 and accurate cost records of its flights under various loads are to be made with a view to determining the commercial possibilities of this type of aircraft.

The Navy may in this way be able to aid the establishment of a new method of air travel. The military use of the big airship will be as a scout for operation with the service battleship fleet.

The ZR-1 is 680 feet long, 79 feet high, and has twenty gas cells with a total capacity of 2,115,000 cubic feet of gas and a gross lifting power, with helium, of 120,000 pounds. The cruising range is 4,000 miles. Its six 300 horsepower engines can drive it at a maximum speed of 75 miles an hour or 65 miles an hour cruising speed. These six engines are located in six power-cars, four of which are located amidship; two on each side of the ship. One is in the midline aft, and one is located in the control car in the forward part of the ship.

In this control car are located the rudder control and other instruments used in navigating the ship, while a telephone system connects it with the other cars and parts of the ship.

The mess, bunks, and living quarters for the crew of thirty men are located on a platform laid on the keel and inside the duralumin metal frame which gives rigidity to the ship. The gasoline storage tanks are also located along the walkway which runs for 600 feet along the keel.

There are two observation platforms on top of the ship access to which is had by means of ladders and hatchways running up through the center of the ship. In the bow is a mooring device with cable by which the giant dirigible can be moored to a mast.

The framework is of duralumin metal, the twenty cells for the lifting gas are made of goldbeaters' skins, while the outer envelope of the airship is made of cotton fabric doped with a special preparation to resist weathering.

The hangar which now houses the ZR-1 at Lakehurst is so large that the U. S. Capitol could be placed entirely inside with the exception of eighty feet of the dome which would project above the roof.

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New York, G. P. Putnam and Sons, 1922.

NEWS OF THE STARS

By Isabel M. Lewis,
U.S. Naval Observatory.

GREAT CLUSTER OF GIANT SUNS NOW VISIBLE

Flanked on the east by the small constellation of Lyra, containing the blue-white diamond, Vega, one of the most brilliant stars in the heavens, and on the west by that exquisite little circlet of celestial jewels, known as Corona Borealis, the Northern Crown, the huge constellation of Hercules stretches its ungainly form across the heavens on summer evenings. The hero's head is toward the south and one foot rests on the head of Draco, The Dragon, whose body extends in sinuous curves between the constellations of the Greater and Lesser Bear in circumpolar regions.

A little north of a line drawn from Vega to Corona Borealis and about midway between them, on the western side of the trapezium that outlines the body of Hercules, is a small hazy cloud of light faintly visible to the naked eye on clear summer evenings when there is no moonlight. Faint and inconspicuous as it may appear without the aid of a telescope this small patch represents one of the most magnificent objects in the heavens, the Great Star Cluster in Hercules. Photographs taken with the most powerful telescopes resolve this misty cloud of light into a magnificent cluster, of globular form, containing over thirty thousand suns, red, yellow or white, some of which fluctuate with the greatest regularity in brightness in periods of a few hours, days or weeks. These are the stars of the Cepheid variable type whose light variations have been utilized in determining the distance of the cluster in which they occur.

Dr. Harlow Shapley's studies of globular star clusters, of which there are some ninety-odd in the entire heavens, have shown that stars of this cepheid variable type occur in all globular clusters. As stars of this type occurring

elsewhere in space are known to be all giant stars, of well-determined light-giving power, it is assumed that the Cepheids in the globular clusters are the same. As a result the distances and diameters of all the globular star clusters have been obtained from a study of the stars they contain.

Their distances from the earth range from about 10,000 light years for the nearest to 220,000 light years for the most distant. They are all exterior to the Milky Way and are in general moving toward it at high velocities.

The Great Hercules cluster is one of the nearer of the globular clusters. Its distance from the earth is 35,000 light years, its diameter is 350 light years, and the stars near its center, where the condensation is greatest, are, it has been estimated, less than one-fifth of a light-year apart. Compare this stellar density with that in the vicinity of our own sun where the nearest known star is four and a third light years distant and where it is estimated there are only about thirty stars within a radius of fifteen light years of the sun!

The thirty thousand stars that are visible in the Hercules Cluster are, moreover, all more brilliant than the sun. At a distance of 35,000 light-years the sun would appear a little fainter than a star of the nineteenth magnitude and stars of the nineteenth magnitude are the faintest that have been photographed with the most powerful telescope in existence, the 100-inch Mt. Wilson reflector. In addition to the 30,000 stars in this cluster that lie within reach of powerful telescopes, the majority of which are giants, there are doubtless many thousand dwarfs equal to or less than our own sun in light-giving power.

The great Hercules Cluster is approaching the Milky Way in which our own sun is located, at the rate of nearly 200 miles per second. What will happen when it reaches it a few million years hence is an interesting question.

Dr. Shapley has expressed the view that the globular star clusters become more or less disintegrated and scattered when they enter the star-fields of the Milky Way and that the loosely-formed star clusters of the Milky Way may be remnants of globular star clusters that have attempted to cross the Milky Way.

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EGYPTIANS RIVALLED MODERN TANNERS

Pictures of leather tanning found in the Egyptian tombs of three thousand years ago show methods of preparing leather which the tanning chemist only succeeded in surpassing in relatively recent years, Prof. James S. Long, associate professor of inorganic chemistry at Lehigh University, said recently.

He has made a special study of leather and methods of preparing it, and he found that it took all the skill of the modern chemist to evolve a process better than that used by the ancient Egyptians. They tanned their leather by rubbing it with juices of astringent barks, sour milk and oils and treating it with smoke,

in all probability, and these same methods were used until relatively a few years ago.

"The leather we wear today has been differently treated, however, from that used by King Tut's compatriots," Prof. Long said. "Chromium compounds have largely replaced bark extract in treating the uppers, and the chemist has worked other wonders in shoe leather. The chemist understands and controls the changes that the skin undergoes in becoming leather.

"The hair must be removed from the skin - but not by acids - it must not be injured. Indeed, a chemist wastes nothing - certainly not hair. Then the flabby skin must be changed by successive chemical baths to the product which will stand the action of bacteria, water, and city streets - the product we call leather.

"Now it is considered hard to fabricate two pins alike from standardized raw materials. But how about goatskins? Goats may all be similar to the extent of possessing a passionate taste for paper and clothes, but their skins are not similar. No two seem alike. Not only that, but the sides of the same skin are different. A chemical bath right for one skin would spoil another. The skins must therefore be sorted and resorted at each step in the process, and at best only a certain proportion turns out as desired by the tanner. Further, the tanner knows that this will be the case before he puts the skins in their chemical baths.

"The product is soon given the necessary permanent chemical protection, but it must in addition be rendered suitable for modern feet. Natural oils must be worked in to make it soft. It must be colored to suit the whims of college boys or to match a fawn colored dress.

"Finally, the surface must be made attractive. With some skins this is done by 'glazing' a coating of dried blood with suitable colors. Other times the leather is coated with an enamel of collodion and boiled linseed oil. We call the glossy-coated product 'patent' leather. Formerly the oil for this was cooked much as a housewife cooks jelly. When it would form "strings" or "leaves" of certain description, it was considered 'done'. But oil varies, and with this rule of thumb end-point, the product was not always the same. Patent leather used to crack. This was its most widely known characteristic. But the chemist came to the rescue. More uniform raw materials, better colors, a scientific method of determining when the batch was done - these and others were his contribution. He even did without the leather and fashioned his product on cloth instead.

"This chemical development of enameled leather and cloth is noteworthy. Patent leather shoes look continually well if rubbed off occasionally with a moist cloth. The saving in shines will pay for the uppers in a short time. The bathroom furniture escapes daubs of black so often characteristic of home efforts of economy. Time is saved in the affairs of men. Thank the chemist for it.

"But much is yet to be done in this field. The chemist does not yet know the full composition of the raw materials which he converts into leather. Of course he will take up the needed research, but much of it is not of the simple type which can be done in the tannery. We must look rather to the technical

school with its more favorable environment and its wealth of knowledge of the modern sciences of physical and organic chemistry."

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Dr. Edwin E. Slosson

C H A T S O N S C I E N C E

A NEW PATH TO OBLIVION

It is within the memory of many still living that science revealed to mankind means of escape from the pains of disease and surgery. Nitrous oxide and ether were used for amusement long before they were used for relief. Medical students in New England used to take laughing gas or indulged in "ether frolics" for the fun of the thing without thinking of the possibilities of applying it in their profession.

But in 1844 a Connecticut chemist named Colton had a big back tooth pulled out after inhaling nitrous oxide and two years later, Dr. Morton, a Boston dentist, put himself to sleep with ether and then tried it on a patient who came into his office as he awoke. The use of anesthetics was bitterly opposed at first on the ground that pain was a punishment or a natural process and that it was cowardly or wicked to evade it, but the new practice prevailed and brought surcease of suffering to uncountable millions of men, women and children in the last seventy-five years.

Nitrous oxide and ether have been the chief means of producing complete unconsciousness but now a new agent of anesthesia has entered the field that promises to rival or supplant both. This is ethylene, a gas composed of hydrogen carbon, long in use for illuminating but which has recently been found by Professor A. B. Luckhardt of the University of Chicago to have the power of putting a person to sleep without the danger and unpleasant after-effects that sometimes attend the use of the older anesthetics. On inhaling the gas the patient passes quickly into insensibility and then into complete unconsciousness. The respiration and blood pressure remain regular and the muscles are relaxed. The recovery is remarkably rapid. Within three or five minutes the patient comes to his senses and usually without nausea. In the case of a severe operation on the leg the patient had to be kept under the influence for three hours and ten minutes continuously. Yet five minutes afterwards he had become conscious, got off the operating table himself and two hours later ate a meal.

In the four months that the new anesthetic has been in use at the Presbyterian Hospital in Chicago some 350 operations of all sorts have been successfully performed under its influence. A Chicago dentist has extracted teeth from about

a hundred patients using ethylene in place of nitrous oxide. It has also been found useful in normal childbirth.

The discovery of the soporific effect of ethylene came through a curious chain of circumstances. In 1908 the carnation growers complained that they were losing money because the flowers they shipped to Chicago went to sleep when put in the greenhouses and the buds failed to open. A couple of botanists from the University of Chicago were assigned to the job of running down the reason of this floral "sleeping sickness" and found that it was due to the leakage of illuminating gas which contained four per cent of ethylene. This is commonly added to city gas to increase its candle power. Plants are extremely susceptible to ethylene. Sweet peas will droop their leaves if the room contains one part of ethylene in a million of the air; a much more delicate test for its presence than any chemical reaction. This may be a reason why plants do not thrive and people get sleepy in houses where the gas fixtures are leaky.

Since the investigation now led out of the vegetable kingdom and into the animal it passed over into the hands of the physiologists who carried the experiments on up the scale of life, using frogs, mice, rats, guinea-pigs, rabbits, kittens and dogs successively as subjects. It was found that ethylene brought the animals into unconsciousness in half or a quarter of the time necessary for nitrous oxide and that they recovered more quickly.

Finally Dr. Luckhardt and his colleague, Mr. Carter, having thus assured themselves of its safety and learned how to administer it, tried it on themselves and for several successive Sunday afternoons put themselves to sleep by the inhalation of ethylene. They have both been anesthetized a dozen times since without noticing any untoward symptoms.

The gas is inhaled with oxygen as is the custom with nitrous oxide. Between 80 to 90 per cent. of ethylene is sufficient in most cases to bring the patient to the point where a surgical operation may be carried on. Care must be taken of course to see that the gas is pure and also to keep it away from flames since ethylene, like ether vapor, is inflammable.

The brief history of ethylene as an anesthetic is a striking illustration of the acceleration of scientific progress in this century. In 1798 Humphrey Davy, then only 22, discovered nitrous oxide and suggested that it might be used to stop the pain of surgery, but it was half a century before this hint was acted upon, fifty years of unnecessary pain and loss of life. But in the case of ethylene the progress from pinks and peas to professors and patients was made with swift sure steps and in the course of a few months humanity was receiving relief from this new source.

When it was proposed to erect in Boston a monument to the discoverer of anesthesia a hot discussion took place as to who was entitled to the honor. Should it be Dr. Morton, who pulled the first tooth with ether, or Dr. Jackson, who told him how to use it. Dr. Oliver Wendell Holmes then suggested that the statues of both claimants be put on one pedestal inscribed "To Ether". This is one of the jokes that no Englishman can understand, for he would pronounce it "eye-ther".

If ethylene proves to be as useful as it seems to be, room must be found on the same pedestal for Dr. Luckhardt, even though it spoil the pun.

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SWAMP PLANT KILLS MOSQUITOS IN PONDS

One pest of the summer countryside may be used to kill off another if the experiments of Dr. Angel Brioso Vasconcelos of Mexico City can be transplanted on a large scale to the vacation region of North America. He has found, according to a report to the American Public Health Association, that some species of algae, the smelly little plants that cause the green scum on ponds and the fishy taste to drinking water, are deadly poisonous to mosquitos.

Dr. Vasconcelos is subdirector of the special committee for yellow fever control of Mexico, and first became acquainted with the reported anti-mosquito tendencies of these algae when directing a campaign against the disease in Vera Cruz in 1920. When he and other workers attempted to repeat experiments reported by earlier students the results were entirely negative. More recently he has been so successful that he considers the poisonous effect upon mosquitos of some algae practically demonstrated.

The toxic plant is "*chara gymnophylla*", the so-called "water corn" of Yucatan, where it grows freely in deep fresh water ponds. Dr. Kisandro Dorantes of Progreso reported to Dr. Vasconcelos that he had never found mosquito larvae in ponds where the "water corn" was growing and suggested that he experiment with that species of algae. He accordingly sent some of it to the Mexico scientist, who planted it in water jars.

It grew luxuriantly. In a day or two Dr. Vasconcelos observed a great growth of mosquito wrigglers in the jar, and thinking the experiment a failure and not wanting to start a mosquito nuisance, he poured oil on the surface of the water and so killed all the baby mosquitos. The next day he washed away the oil. Two days later he was surprised to find another growth of mosquito larvae in the jar and was more surprised when he found them all to be in a dying condition.

This he attributed to the effect of a small residue of oil, but after carefully washing away the last traces of it, he still observed that succeeding crops of mosquito larvae died soon after hatching. Even adult mosquitos on the surface of the water in which the "water corn" was growing seemed doped by it and were easily caught with the fingers.

So Dr. Vasconcelos believes that the algae secretes some poison which is specific for mosquitos. Other water insects survive in the water in which these algae grow. Several other species of the genus "*chara*" have been found which seem to have this toxic property and experiments to determine their efficacy are

continuing. If it is confirmed it will mean another great weapon in the fight against the mosquito and incidentally against the diseases which it transmits. A few species of chara are known to exist in the United States and it is possible that some of them may be found to possess anti-mosquito properties.

LIGHT TESTS DETECT CULTIVATED PEARLS

Dr. Fred E. Wright of the Geophysical Laboratory, Washington, has thrown light, literally, on natural pearls and cultivated pearls and now they can be told apart.

There are now three kinds of genuine pearls. Most valuable are the "natural" or "normal" pearls found by divers the world over. "Blisters" or baroque pearls, not nearly so beautiful or expensive as the "natural" article, have been for years produced simply by inserting a foreign body in the producing oyster. But recently a Japanese, Dr. K. Mikimoto, succeeded in developing a patented method for inducing pearl oysters to grow pearls which are spherical in shape and similar in external appearance to fine "natural" pearls. Mikimoto's cultivated pearls are now on the market and pearl merchants and jewelers have had difficulty in distinguishing them from the natural article.

His process is to remove a pearl oyster from its shell, cut a patch off its outer, shell-secreting mantle large enough to enclose, as a sac tied at the neck, a bead of mother-of-pearl or even an inferior pearl. This bead is imbedded in another live oyster, which, after proper treatment of the wound, is returned to its native habitat where in the course of a few years a coating of pearl may be deposited around the inserted bead.

Dr. Wright's methods for detecting the presence of such a bead of mother-of-pearl depends on the fact that the layers of the natural pearl and the mother-of-pearl nucleus reflect light differently. One method of finding the cultivated pearl, he explained, is to stand with your back to the window, sun or other strong source of light, and hold the pearl so that it is illuminated by the light. When the pearl is rotated on a string, the characteristic sheen of the mother-of-pearl can be clearly seen shining out from inside the pearl when the pearl is in certain positions.

Another method of distinguishing the fine pearl from the cultivated one consists in placing it on a thin sheet of metal directly over a small hole drilled through the metal. The hole serves as an opening through which a beam of strong light passes. The only light that reaches the observer comes through the pearl and shows the shadow of any foreign nucleus which may be in the pearl.

When a small real pearl is used as the center of a larger cultivated pearl, this nucleus can be discovered by an examination of the hole drilled through the pearl for stringing it. A boundary between the nucleus and the outer pearl substance is seen with the aid of a tiny mirror and a microscope. The mirror is made by holding the end of a fine gold wire in a Bunsen flame for a time sufficient to melt down the tip and form a small bead, which presents a smooth and excellent reflecting surface. This wire with the tiny mirror on the end is inserted into the hole in the pearl which is illuminated by a strong light from the side and the reflections from the bead are observed through a low power microscope.

1923 HEALTH RECORD SHOWS TUBERCULOSIS AND CANCER DECLINES

The general health record during the first half of 1923 was more than satisfactory, Dr. Louis I. Dublin, statistician of the Metropolitan Life Insurance Company, said recently in an exclusive Science Service statement. Following a most unpromising beginning, chargeable wholly to the influenza outbreak of the early months of the year, a consistent improvement has since been in evidence. At the end of the half year, the death rate of the millions of white policyholders of the Metropolitan Life Insurance Company was only one-third of one per cent. in excess of that for the corresponding period of 1922. For the colored policyholders, the increase was 4.2 per cent. These small differences are very encouraging, coming as they have in the face of high influenza-pneumonia mortality during the first three months. The excellent health record of the second quarter has almost wiped out much larger adverse margins than were in evidence three months ago.

"The best feature of the health record of 1923, to date, is the continued improvement in the tuberculosis death rate," Dr. Dublin said. "Almost beyond peradventure, a new minimum will be recorded this year in the mortality from tuberculous disease. The continuous decline (except for a single year) that has been observed since 1911 is still going on.

"Another encouraging item of the 1923 health record, to date, is a decline in the mortality from cancer. This has been considerable among the white policyholders and there has been a slight drop among the colored."

The mortality from diseases incidental to pregnancy and child birth has shown pronounced improvement and if the present favorable record is maintained throughout the year, the death rate for these diseases will be lower than for any year since 1917.

Two of the four principal communicable diseases of children, diphtheria and scarlet fever, registered lower death rates than for the first half of last year, Dr. Dublin's figures show. The drop in the diphtheria rate was considerable and unless there are very unfavorable developments later in the year, the 1923 mortality from this disease will be the lowest ever recorded among Metropolitan Industrial policyholders. Measles and whooping cough, particularly the former, are causing many more deaths than during the first half of 1922. The measles rate has more than doubled among white policyholders and among the colored it was almost six times as high as for the first half of last year. An unusual item in this year's record is the very high measles death rate among colored policyholders. Ordinarily, mortality from this disease among colored children is less than that for white children; but this year the difference is very small.

Two hundred and forty-one deaths were caused by alcoholism during the first six months of 1923, corresponding to a death rate of 3.3 per 100,000. This may be compared with 133 deaths during the first half of 1922 with a death rate of 2.0. Since the first of January, 1922, 534 deaths from this disease have been recorded among American and Canadian Industrial policyholders. Of these, 531 were distributed among 34 American states, while 3 occurred in the Canadian Province of Ontario. In addition 20 deaths were recorded from wood and denatured alcohol poisoning.

The record of the half-year for accidental deaths compared unfavorably with the figures for the corresponding periods of 1922 and 1921. Substantial increases are in evidence for both white and colored persons. Automobile fatalities have increased materially.

TABLOID BOOK REVIEW

THE SCIENCE OF COMMON THINGS. By Samuel F. Tower and Joseph R. Lund
D. C. Heath & Co., 1922. \$1.60

A splendid introduction to the study of science, for it treats of the most practical everyday things from the point of view of experiment in the truly scientific manner. It is to be regretted that the organization of our schools do not allow this book to be put into the hands of children of eleven or twelve years, or even younger, -- in fact as soon as they can be trusted not to upset the acid bottles in their laps. By high school years the pupils should have gone on to more specialized work in the formal sciences.

The individual and home projects described in this book are especially to be praised. They are useful and stimulating tasks which fit into home activities, and from each one the child will learn through eye and hand the application of important principles of school knowledge.

H.M.D.

There is said to be a high death rate among physicians in Russia due to lack of food, overwork, and exposure.

Certain small spiders are active in the destruction of malaria-carrying mosquitoes in the South.

The roots and leaves of the common water-cress of our eastern ponds and streams develop larger roots and broader leaflets when cultivated out of water.

About sixty-five per cent. of the water power of the United States is located in Washington, Oregon, Idaho, Montana, and California.

Although people all over the world continue to build "castles in Spain", the Commerce Department reports a housing shortage in that country.
