

SCIENCE NEWS

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THE STAR BETA LYRAE

If it could be seen from the proper angle, through some super-telescope many times more powerful than any now contemplated, the star Sheliak would be revealed as a gigantic pinwheel of red, yellow and green gases, spiraling outwards from a double star at the center to a distance of 50,000,000 miles. This star, called Beta Lyrae by astronomers, is in the constellation of Lyra, the lyre, near the bright star Vega, which can now be seen in the northeast about midnight.

The pinwheel conception is given by Dr. Otto Struve, director of the Yerkes Observatory, in a paper in the April issue of the *American Journal of Physics*. His ideas are based on the researches of his colleague, Dr. Gerald P. Kuiper.

Beta Lyrae is normally fairly bright, of the third magnitude, but in 1784 a 20-year-old deaf mute in England, John Goodricke, noticed that it varies in a period of a little less than a week. Later it was found that the star's cycle is really 12 days 22 hours. From its full brightness, after 6.5 days, it decreases about a third, then it returns to the original, and drops again, this time to about two fifths of its former brilliance. Then it brightens again, and the cycle starts over.

Though it was long ago realized that this is a double star, with two parts, revolving around their center, and that sometimes both stars are visible, sometimes one, and sometimes the other, depending on which is in front, many peculiarities were discovered, requiring an elaboration of the theory. Many of these were found in analyzing the star's light through the spectroscope. Now, however, astronomers have evolved what appears to be a satisfactory theory to explain its mystery. Dr. Struve summarizes the conception as follows:

"The star is actually a binary, just as the older theory had predicted. However, the cool and relatively small star which turns around the hot supergiant is so much fainter in light that we can not even photograph it; in the time required to record it, the image of the hot supergiant would be so completely overexposed that the photographic emulsion would be burned out. Of course, the distance of Beta Lyrae is so great that we can not actually see the pinwheel structure of the expanding gases, or the motion of the faint companion around the primary star. Even the greatest telescope now in existence is much too small to bring this marvel to our eyes. We must be content with information secured by theory and indirect observation. Imagine then a giant sun so hot that its color is essentially blue, so large that a good portion of the entire solar system could be hidden within its confines, and so brilliant that our sun would completely disappear in its glare. At a short distance, probably less than the radius of the large star, is another sun, yellow in color, and relatively cool, though hotter and considerably larger than our sun. This yellow star revolves around the blue supergiant once in 13 days. Its gravitational attraction upon the supergiant is tremendous. Tides tend to elongate the latter, until its shape is like that of an egg, and

until some of its outer gases coalesce with the gases of the yellow sun. This spiral is hot—almost as hot as the blue supergiant; and the gases shine in all the colors characteristic of electric discharges in gases—luminous hydrogen with its red tinge, helium with yellow and green, neon with its red; the matter spirals out with a speed close to 100 miles per second."

THE SPEED OF LIGHT

LIGHT travels at a speed of 186,272 miles per second, a figure which is probably not more than 8.7 miles per second in error. This new value, about 12 miles per second less than hitherto generally accepted, has been reported by Dr. Wilmer C. Anderson, now with the American Research Company, of Beaumont, Texas. He made the determinations while on the staff of the Croft Laboratory of Harvard University. This does not, however, mean that the velocity is lessening, for he has included correction for a factor known as "group velocity," which has been assumed to be negligible in previous researches and has been neglected. This might amount in some cases, he says in a paper in the *Journal* of the Optical Society of America, to as much as 4.3 miles per second. He concludes, therefore, "that the velocity of light is a constant as nearly as we can measure it at present."

Dr. Anderson's measures were made with the aid of an electric eye, or photoelectric cell, and used automatic means of recording the data, eliminating, to a great extent, errors of human measurement. Fundamentally, this was the method used. An electric current vibrating 19,200,000 times a second controlled a Kerr cell, which is a form of light valve, and produced a beam of light with the same number of variations per second. This beam, therefore, was made up of sections of light a few feet long, alternated with dark spaces of the same length. By a mirror with a very thin coating of silver, this beam was divided into two. One part was sent to a near-by mirror and back, the other part traveled over a much longer path before it was sent back, and the two recombined, to fall on the electric eye.

If the two parts of the beam are joined so that the bright and dark portions are exactly in step, then the light falling on the electric eye varies just like the original beam, and there is a maximum electric current from it. Now, if the near-by mirror is moved, the path of the first part of the light beam may be increased by just the length of one of the bright sections. Then, when the two parts of the beam are brought together again, the dark part of one will coincide with the bright part of the other. The resultant beam will then be steady, and no current will come from the electric eye. From the difference in the light paths when this minimum value of the current is reached, the speed of the light may be calculated.

Elaborating greatly on this fundamental method, Dr. Anderson and his associates made 2,895 measurements. These give the speed of light as 299,776 kilometers (187,272 miles) per second. This may be in error as much as 14 kilometers (8.7 miles) per second. The chief source

of error remaining is one that involves the electrons in the electric eye which watches the changing light beam. The electrons which are shot out from the sensitive surface of the photoelectric cell where the two parts of the beam strike, have to travel a slightly different distance, and this prevents the most accurate measurement of the times when the beams are in and out of step. This problem, he says, will have to be solved before the accuracy of the method may be increased.

THE NUMBER OF DEFECTIVES IN THE UNITED STATES

FREDERICK OSBORN, chairman of the Joint Army and Navy Committee on Welfare and Recreation, speaking before the recent meeting of the American Eugenics Society stated that the first contribution of eugenics to national defense should be reducing the number of defectives in the United States.

"The public should insist that doctors and public health authorities get to work at reducing the number of defectives," Mr. Osborn said. He pointed out that two or three million people in the United States are so seriously defective in mind and body that they are a tragic burden to themselves, their families and their communities. Declaring the majority of these defects hereditary, and quoting Justice Holmes's statement, that three generations of feeble-minded are enough, he said that conservative methods, generally approved by the public, can lessen numbers of these defectives born in this country. These methods are "registration, segregation and refusal of marriage license to the feeble-minded; use of contraceptives under medical advice by mentally normal carriers of defect; extensive search for bad family strains."

Even more important for national defense, he added, is the second contribution of eugenics—to encourage abler stocks of people in every section of the country and every social class, rich or poor, to have more children than their irresponsible neighbors.

Denouncing dictator tactics of arbitrarily controlling births as not eugenics at all, Mr. Osborn said: "The right to have or not to have children must be safeguarded in a democracy, along with the right to freedom of speech and freedom of worship." He emphasized that a democracy must provide social conditions to enable abler stocks to have good-sized families, and these able people must contribute the material for leadership.

THE NEW REGIONAL LABORATORIES OF U. S. DEPARTMENT OF AGRICULTURE

THE four new regional laboratories of the U. S. Department of Agriculture, now just getting into action, will permit larger-scale experimentation than has been possible in the past, according to a report made by Dr. Henry G. Knight, chief of the Bureau of Agricultural Chemistry and Engineering, at the Seventh Annual Chemurgic Conference.

About a third of each of the million-dollar buildings will be devoted to pilot-plant operations, that is, experiments using equipment only a little less than full factory size instead of the small flasks and test-tubes of the

ordinary laboratory. Pilot plants enable manufacturers to get an idea of how profitable an operation that is known to be theoretically possible may be.

These laboratories at Philadelphia, New Orleans, Peoria and near San Francisco, to work on typical agricultural products of East, South, North and West, respectively, will be staffed by about a thousand men and women, including some of the most successful chemists the country has produced.

Dr. Knight pointed out that "It is a comforting thought to know that these laboratories could be turned into research institutions for national defense should the occasion demand. If we should lose the freedom of the seas and be cut off from the rest of the world our export trade would probably drop below the low mark where it now stands. It is reasonable to assume that such a situation would further increase the surplus problem and make it necessary for us to create in this country, if possible, greatly expanded markets for many of our major farm crops. That's the object of the laboratory program."

THE CONTROL OF CANCER

PERIODIC physical examinations, urged by the American Society for the Control of Cancer as a means of detecting early cancer, can be obtained for from 50 cents, or even nothing, to \$5, the latter for persons with incomes of \$5,000 or more. These fees apply in New York City, where "there are excellent facilities for men and women to get themselves examined for cancer and be treated at modest fees." The question was one of a number submitted by the National Association of Science Writers to the American Society for the Control of Cancer.

Outside of New York City facilities for cancer diagnosis and treatment seem to vary widely. Information from the survey was summed up as follows: "On the question of indigents, states vary widely in their handling of these patients, some of them depend on County Commissioners, on social agencies, or on welfare boards, others rely on state appropriations for cancer control. The physician-spokesmen felt that examinations and medical treatment could be had by those seeking it. In certain large western and southern states, those in rural areas seem less well cared for than those in cities. In several areas, it was not possible to secure long hospitalization for indigent patients for whom there was no hope of cure."

Standard fees for examination and diagnosis can be set, as they are in New York City, on the basis of the patient's income. Fees for treatment can not be standardized. This was explained as follows:

"It was agreed that physicians by and large carefully fit their fees to the patient's income and ability to pay. The problem of a standardized fee for treatment is very difficult since the individual cases vary so widely and require such different types of treatment. Cancer, it must be remembered, is not one disease but many, and the prognosis and treatment of cancer of the stomach, for instance, is entirely different from cancer of the breast; cancer of the skin and cancer of the bone are unlike in so many ways as to make it impossible to set a blanket fee for their care."

LIFE-SAVING OXYGEN SHIRT

A LIFE-~~SAVING~~ "oxygen shirt" to aid life guards in rescuing drowning persons is announced by Dr. Christian J. Lambertsen, of the University of Pennsylvania Medical School, in the *Journal* of the American Medical Association. With this apparatus strapped like a harness to his back and chest, the life guard will be able to stay under water for from 18 to 25 minutes in depths to 60 feet while searching for drowning accident victims, instead of the usual one minute at depths to 30 feet.

The oxygen harness which thus increases the life guard's life-saving ability weighs just over 12 pounds in air. Under water it is practically weightless. A small cylinder for oxygen or an oxygen-nitrogen mixture fits into a pocket. A nose and mouth mask, rebreathing bags, lead plate and a soda lime container are the other chief features. The breathing bags, breathing tubes and inhaler are all buoyant under water and their lift almost exactly balances the under-water weight of the oxygen cylinder, regulator, soda lime container and the lead plate. The apparatus can be strapped on and be in use within 15 seconds or less. It is designed to fit persons of varied size and shape without time-consuming adjustments. Unlike the deep-sea diver's outfit, this apparatus does not require an assistant at the surface but it does not give protection against cold while under the water.

Besides helping life guards and others to rescue drowning persons, the apparatus could be used for inspection and minor under-water repairs of hulls of boats; for pearl and sponge fishing; sport, as in goggle fishing; and, with slight modifications, in mines, sewers, chemical plants and gas companies where the atmosphere is deficient in oxygen or contains noxious gases.

ITEMS

WILD ducks have responded amazingly to the opportunities offered by new refuges, according to the U. S. Fish and Wildlife Service. A census of one Southern refuge, on the White River in Arkansas, shows a population of about a million and a half ducks, mainly mallards, and other species wintering there. Growth of food plants that ducks like is being encouraged, to meet the increasing demands. Observers have noted an increase in the number of Canada geese wintering on the White River Refuge this year. D. N. Graves, director of the Arkansas Fish and Game Commission, reports that "The increase in the number of geese in Arkansas this year is remarkable, and the ducks have also increased substantially. It is evident that the Fish and Wildlife Service refuge program is bearing fruit. I have seen more ducks on the White River this year than I have ever seen in my life."

ON a recent cruise to the Gulf of California by the E. W. Scripps, research vessel, a core of diatomaceous mud nearly 17 feet long was hauled up from the bottom, an all-time record. Until the present time the longest core of mud has been about 10 feet, according to Dr. Roger Revelle, of the institute. He stated that the new record was established because of two factors: first because the diatomaceous mud in the Gulf of California is extremely soft, and second because important improvements have

been made on the coring equipment. It was designed by R. S. Dietz and K. O. Emery, graduate students of the University of Illinois, who have spent two years at La Jolla. The coring equipment consists of a long barrel, 20 feet long and 2½ inches in diameter. The lower opening is slightly smaller than the barrel, and the barrel itself is lined with celluloid, both factors being important in reducing friction. The equipment is lowered to the ocean floor by cable and the force of gravity drives it into the mud.

THE fossilized comb of a wasp nest whose inhabitants might have stung the last of the dinosaurs has been added to the collections of the Smithsonian Institution. It was found in southwestern Utah by Dr. J. B. Reeside, Jr., and Dr. C. E. Dobbin, of the U. S. Geological Survey, and has been described in the *American Journal of Science* by Dr. Roland W. Brown, also of the survey. It dates from the last Cretaceous, last phase of the dinosaur age, about 80 million years ago. Wasps, according to Dr. Brown, apparently preceded their relatives, the bees, into the world, and pioneered in the transfer of pollen among flowering plants.

THE power of 40,000 horses will be yielded by a single motor just completed at the Westinghouse works in East Pittsburgh. Largest of its kind, the motor will drive air as fast as 400 miles per hour through the Air Corps' new plane-testing wind tunnel at the Wright Field, Dayton, Ohio. It is expected to be completed and ready for testing full-sized plane propeller and engine enclosures by July 1. The motor will turn two fans, each as tall as a four-story building, and with 16 blades. The frame of the motor is so big that a small truck could be driven through when the 50-ton motor is removed. Despite its size, explained C. M. Laffoon, engineer of the Westinghouse Company, the speed can be varied from 37 to 297 revolutions per minute. Ordinarily the speed of such an induction motor would be regulated by rheostats and resistances through which excess power would be used up as heat when operating at reduced speeds.

Two electrical generators at Grand Coulee Dam, Washington, are now in operation, producing for the first time power from the water of the Columbia River impounded behind this dam, mightiest man-made masonry structure in history. These Westinghouse generators, each weighing 88 tons, 13 feet high and delivering 10,000 kilowatts of electrical energy, are pygmies compared with the three main generators which will be in use by next summer. These, the largest ever constructed, are also being built by Westinghouse, and will be 24 feet high and 45 feet in diameter. Each will yield 108,000 kilowatts, and the trio would be capable of lighting New York and Chicago combined. Eventually there will be a total of 21 generators here, eighteen of 108,000 kilowatt rating, and three of 10,000 kilowatts, like the two just started. The small generators are now feeding a line connecting the Grand Coulee and Bonneville Dams, so the power they produce will supplement that from Bonneville, supplied to important defense industries. When the big generators are in use, the small ones will supply power for the station itself.