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# SCIENCE NEWS BULLETIN

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## SOLAR ECLIPSE EXPEDITIONS TO TEST EINSTEIN'S RELATIVITY

By Basil Newcomb
of the Harvard College Observatory
(Special Science Service Correspondent)

Harvard College Observatory, Cambridge, Mass., December 00.- American and English astronomers will go to the ends of the earth next year to test Einstein's theory of relativity. On remote islands of the Indian Ocean and in the uninhabited deserts of northwestern Australia they plan to observe the positions of stars during the total eclipse of September 20, 1922.

The coming eclipse is of more than usual interest, both to scientists and the world at large. Observations at the last solar eclipse raised Einstein's principle of relativity from a doubtful speculation to an accepted theory. The world is eager to know whether the repetition next year of the photographic test made by the British astronomers in 1919 will give the same positive results in support of the Einstein hypothesis.

Next year's eclipse of the sun will be visible as a partial obscuration over the greater part of the Indian Ocean, southern Asia, Malaysia, and Australia. But the astronomers are interested only in the narrow path of totality, about fifteen miles wide, which stretches across the Indian Ocean and Australia from the eastern edge of Africa.

There are four possible points of observation of the total eclipse; the Maldive Islands, Christmas Island, and points near the coast of northwestern and southeastern Australia.

The Maldive Islands, a thousand miles south of Bombay, have not been chosen by astronomers as an observation point because heavy winds may be expected, and because of the lack of transportation facilities to the islands.

### Americans Go to Australia

British astronomers plan to send an expedition to Christmas Island, which lies about 250 miles south of the western end of Java. The chances for a clear sky in that locality are good, according to available meteorological reports.

Northwestern Australia is the place chosen for the American expedition from the Lick Observatory, Mount Hamilton, California. The American astronomers plan to go to a place on the desolate Australian coast called Ninety Mile Beach, near the telegraph station Wollal. This is on the edge of the Great Sandy Desert; but Professor W. W. Campbell, Director of the Lick Observatory, reports a government well in the vicinity with an abundance of good water, and claims that weather conditions at this point will be better than at any other accessible station along the path of the total eclipse.

Southeastern Australia is much more easily reached than any of the other possible sites for observing stations, but weather conditions are not likely to be so

favorable. Rainfall, cold weather, and dust storms are frequent there in September, and as yet no expedition to that region has been announced.

## How Relativity is to be Tested

During the time that the sun is totally eclipsed, the stars in the neighborhood of the sun can be photographed. The photographs are later compared with others of the same region of the sky made at a time when the sun is not present, that is, a few months earlier or later. If on the two sets of photographs (one with the sun on the picture and one without) the stars occupy the same positions relative to each other, it indicates an absence of proof of the theory of relativity.

The photographic plates taken by the British expedition at the eclipse of 1919, however, showed that the stars very close to the sun's image were slightly displaced away from the sun, and the amount of the displacement agreed nearly exactly with that predicted by Einstein. This remarkable result was accepted by the scientific world as in itself almost sufficient proof of Einstein's theory of relativity. Nevertheless, scientists consider it desirable to have the result confirmed by another observation of the same kind.

The displacement of the star images on photographs made during the solar eclipse is attributed by the Einstein theory to the attraction exerted by the sun's mass on the rays of light passing near it. A star whose light, before reaching the earth, does not pass close to the sun, is not affected. One whose light passes very close to the sun has its rays bent, by gravitational attraction, much as a comet's orbit is swung about the sun, only in a less degree. The effect of bending is to make the star's position, when projected onto the surface of the sky, seem farther from the sun than it really is; and the amount of the predicted displacement should be easily measurable by exact astronomical methods.

The British expedition to Christmas Island will establish its station several months before the eclipse so as to obtain night-time pictures of the portion of the sky later to be occupied by the sun during the eclipse. Their object is to have photographs made at the same place, with the same instruments, and under similar conditions, with which later to compare the eclipse photographs.

## Two American Eclipses Coming

Up to the present time only the two astronomical expeditions mentioned above have been announced. No doubt others will be planned during the coming year. But it is possible that many will wait for the total eclipse in September, 1923, which can be conveniently observed in the extreme southwestern corner of the United States. The central line then runs through the city of San Diego, and crosses some of the easily accessible islands off the southern California coast.

Two years later a total eclipse will occur in New England, but the computations of its precise path have not yet been made public by the government astronomers who are investigating these matters.

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REDUCE WASTE BY MAKING WORK FASCINATING.

Release Tuesday afternoon, December 6.

New York, December 6 (Science Service).- The first step toward the reduction of waste is to make the work fascinating, Walter N. Polakov told the American Society of Mechanical Engineers at its meeting here today.

"Confusion of classes of life has resulted in the building up of industry around the mistaken idea that the workman is an animal and his work a commodity," he said. "Uniting brain work with manual work liberates dormant or suppressed creative capacities of men and not only improves quality and quantity of production but, above all, substantially ameliorates industrial relations."

"Owners thereby develop a steady, contented, intelligent and highly productive personnel, thus eliminating a major part of past and present embarrassments, conflicts and losses. The labor group simultaneously frees itself from the oppressive feeling of drudgery of work, satisfies its human consciousness, secures opportunities for intellectual and technical advancement and improves its material status."

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(Editors: In this third article of our series on the problems of the Pacific, Mr. Allen describes how the geographic features of the Pacific region influence the peoples of that part of the world. Next week he will tell how the human race is distributed in the Pacific area.)

## WORLD PROBLEMS OF THE PACIFIC

### 3. The Geography of the Pacific

By W. E. Allen,
of the Scripps Institute for Biological
Research, University of California.

(Science Service)

The surface of the Pacific Ocean itself is greater than that of all the land combined. Not only is it fifty percent wider than the Atlantic in the region of most important contacts, it is still wider in other regions and its basin is much deeper and more sharply defined. North of the tropic zone its expanse of surface is scarcely broken by any island and the outline of its coasts in all regions is remarkably regular, especially as contrasted with the Atlantic coast lines. This is particularly true of its American shores where good harbors are extremely rare and far apart.

Its great surface and volume of water aid the origin and development of storms and cause it to influence American climatic conditions. To a very large extent the shores of the Pacific Ocean slope abruptly downward into deep water and upward to towering mountain masses or lofty plateaus. Very few large rivers empty into it. As a consequence, lands available for support of human population are relatively scant and the limits of their capacities easily reached.

With few exceptions the islands of the Pacific are within the tropics. Between Central and South America on the east and the East Indies and Australia on the West there are vast numbers of small islands many of which are inhabited but few of which are so situated as to have much influence on world affairs under ordinary conditions. The Hawaiian Islands are near the geographic center of the Pacific Ocean proper and for that reason give important aid in maintaining lines of communication and supply between various points of the area.

The eastern border of the Pacific Ocean is formed by the west coast of the two Americas. From Behring Sea to Cape Horn there is scarcely any point at which mountains are not within much less than fifty miles of the shore, and in many cases they rise abruptly from it. This condition is relieved to some extent by a few passes through which rivers from interior valleys flow, but even with such territory included, the inhabitable land is very small in extent.

On the western line conditions are somewhat better so far as the lay of the land is concerned. But the larger part of Australia is a desert region without hope of water supply for any considerable number of inhabitants, and the tropical character of the East Indies makes it improbable that they can ever be much more useful or influential in the world at large than they are to-day. Nor can much more be expected of the Philippines in spite of the progress which is being made in physical and social development.

China occupies the only area in the Pacific region highly favorable for occupation by an expanding population and she has already filled it to overflowing. Her unregulated flood waters slay millions by drowning and other millions by famine through failure of water supply without noticeably affecting the numbers of here people. Japan's island isolation means sharply limited resources which have been for some time strained near to breaking by her excessively numerous inhabitants. The Siberian region north of Japan which, with Alaska, closes the northern end of the Pacific Ocean, has unknown possibilities of development, but so far it has shown no great promise. All things considered there seems to be little land available to accommodate the peoples now present in the Pacific area.

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INVISIBLE ULTRA-VIOLET RAYS MAKE
FACES SHINE WITH PHOSPHORESCENT LIGHT.

(By Science Service)

Release Friday, December 9.

Baltimore, December 8.- A completely dark auditorium was flooded with invisible ultra-violet light which caused faces and clothes of the audience to shine with ghostly phosphorescent light when Prof. R. W. Wood of the Johns Hopkins University addressed the annual meeting of the American Institute of Chemical Engineers here tonight and demonstrated some of the wonders of high-power ultra-violet radiations.

Teeth and eyes shone with great brilliancy and gave off bluish white light. But those in the audience with artificial teeth were detected by the ultra-violet rays. Imitation teeth do not phosphoresce and appear as black as charcoal, as do articles of china and white porcelain.

"The lens of 'pupil' of the eye is also phosphorescent, that is it actually emits visible light when illuminated by the invisible ultra-violet rays," Dr. Wood explained. This phosphorescent light, which is sent out by the lens, passes into the eye as well as out into the room, and, falling upon the retina, produces the curious optical illusion which makes the entire room appear as if filled with a luminous haze of a pale lavender color."

In producing high power fluorescence and phosphorescence, Professor Wood employs a combination of a very powerful quartz mercury arc lamp with a glass which is opaque to visible light but transparent to some of the invisible ultra-violet radiations which are given off by the lamp.

This apparatus was developed during the war by Professor Wood, who held a commission as Major in the Science and Research Division of the Air Service. The ultra-violet lamp was adapted to secret signalling at night, for marking landing fields for night flying aero-planes, and as a position light for ships in a convoy "running dark". The distant lamp could be picked up only by the aid of a special wide angle telescope provided with a phosphorescent screen in the eye-piece.

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A FAIR SIZED FOG MAKES
ONLY A SINGLE SWALLOW

(By Science Service)

Washington, December 00.- It takes a big block of fog to make one good swallow of water, says Dr. W. J. Humphreys of the U. S. Weather Bureau here. The densest fog off Newfoundland Banks contains some 20,000 droplets in a cubic inch, Drs. Wells and Thuras of the Bureau of Standards, found. To get one gulp of water, enough fog to fill a space three feet by six feet by a hundred feet long would have to be condensed. In a fog of that size there are 60,000,000,000,000,- pronounce it sixty trillion,- particles of water, or three times as many particles as the number of dollars spent by the United States during the World War.

"It would take about a half hour to count an inch of fog particles," says Dr. Humphreys. "Placed side by side 2500 to 3000 droplets would be needed to fill that length."

The droplets in a cloud have been found to be, on the average, twice the size of fog particles.

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SAYS COLLEGES ARE DEVELOPING
YOUNG MEN OF ABILITY FOR INDUSTRY

(By Science Service)

Release Tuesday, December 6.

New York, December 5.- More evidence in the value-of-the-college-graduate discussion started by Mr. Edison's famous questionnaire was introduced by C. F. Pratt, vice-president of the General Electric Company, in an address before the meeting of the American Society of Mechanical Engineers here tonight. Mr. Pratt

declared that his careful study of a large number of college graduates employed by the General Electric Company indicates that our educational institutions are developing young men of real ability for the industry.

Do not reduce the amount of cultural studies in order to more intensively specialize on technical subjects early in the beginning of the course, he warned.

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## NEWS OF THE STARS

### New Asteroid Found Solar System's Small Fry.

By Isabel M. Lewis,
of the U. S. Naval Observatory.
(Science Service)

The family of asteroids or minor planets, which now numbers close to one thousand, has been increased by the finding of a new body of the fourteenth magnitude, visible only in large telescopes. This discovery was made by Dr. Hartmann of the observatory of the University of La Plata, Argentina, and has just been announced by the Harvard College Observatory.

But this news is received in astronomical circles with a feeling of resignation rather than joy. It is more labor to compute an orbit and ephemeris of one of these tiny bodies than of a large planet.

Indeed, to keep track of this ever-increasing and troublesome asteroid family is becoming next to impossible. The first few asteroids to be discovered, in the early years of the nineteenth century were the giants of the group. Ceres, the largest and first found, has a diameter of 485 miles and the three next in size, Pallas, Vesta and Juno have diameters of about 300,250, and 120 miles respectively. A few additional asteroids may have diameters in excess of one hundred miles but all of these larger asteroids were doubtless picked up by the telescope or photographic plate long ago and the smaller members of the group that are gradually being gathered in rarely exceed ten or twenty miles in diameter. Still undiscovered, there may be hundreds more of these huge rocks traveling around the sun between the orbits of the planets Mars and Jupiter in paths that are more elongated than the planetary orbits and inclined at greater angles to the ecliptic.

The difference between the planets and asteroids is largely a matter of size. An asteroid compares with a planet about as a minnow compares with a whale.

The task of hunting up names for the various asteroids finally became so great that the astronomer began to catalogue them by numbers and letters and combinations of letters. In the year 1898 when the burden of caring for this numerous family was becoming so great that the astronomer was on the point of neglecting it, an apparently insignificant asteroid catalogued as No. 433, now generally known as Eros, was discovered. A computation of its orbit showed that it lay entirely within the orbit of Mars and that at times it approached nearer to the earth than any other member of the solar system with the exception of the moon. At its nearest approach it is only 13,500,000 miles from the earth.

It was immediately recognized that this tiny body, less than twenty miles in diameter, would furnish a very accurate means of determining the value of that most important constant, the solar parallax, which gives the distance of the earth from the sun. The value of this constant, obtained from observations of Eros, is considered the most accurate now known.

So the astronomer continues to gather in and care for these tiny objects as best he can in hopes of making another find as valuable as Eros. Since the probability of the existence of a trans-Neptunian planet has been recognized, any faint object that appears to be moving slightly in the course of a few hours is an object of astronomical suspicion until its true nature has been determined.

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X-RAYS ARE RULERS FOR
HUNDRED MILLIONTH-INCH MEASUREMENTS

(By Science Service)

Schenectady, N. Y. December 00.- Most expert machinists think they are very accurate when they measure to the quarter of a thousandth of an inch, but science goes them more than 10,000 times better. Dr. W. P. Davey, of the General Electric Company here has been able to use the waves of X-rays as a measuring instrument for the diameters of atoms.

To express these diameters in inches, it would be necessary to write down a decimal point and 7 zeros before putting down the first significant figure, and Dr. Davey doesn't stop at the first figure either.

He measures to three and sometimes four figures. For instance, if you put down a decimal point, followed by 7 zeros, and if then, after the last zero, you put down 123 you would have the diameter in inches of the atom or ion of chlorine in ordinary table salt. The number is accurate to one per cent. Some measurements are ten times as accurate as this, for instance, the distance from the center of the chlorine ion to the center of the sodium ion is 0.00000001108 inches.

To date the diameters of 25 different kinds of ions have been measured. The X-rays not only show the dimensions of these ions, but also their arrangement in space. Some crystals have all the ions apparently arranged on the corners of tiny imaginary cubes, and still others have ions on the corners of cubes and extra ions at the centers of the cubes, and still other crystals have an even more complicated structure.

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NEED MEDICAL POLICE TO
CORRECT CHILD DEFORMITIES

(By Science Service)

Iowa City, Iowa., December 00.- Most cases of deformity in children could be prevented, according to Dr. Arthur Steindler, professor and head of the department of orthopedics in the Children's Hospital of the University of Iowa. His opinion apparently shatters the common belief that the majority of deformities are the result of accident, paralysis, or circumstances of birth.

Before the annual convention of the Iowa State Nurses' Association Dr. Steindler exhibited a girl patient whose shoulders were thrust forward in startling deformity. Her case, according to Dr. Steindler, showed what lack of correction led to, as she had become deformed through "continued uninterrupted bad posture which had been acquired until it was now incurable."

"What we need is a medical police for our children in the public schools," he continued. "If medical agencies could maintain a continuous, regular inspection of boys and girls in Iowa communities, it would be possible to prevent development of deformities which now becomes fixed before proper attention is given them."

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DO YOU KNOW THAT -

The waters of Great Salt Lake contain about 5,000,000,000 tons of common salt. The commercial output of salt from this lake is about 40,000 tons a year.

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The largest telescopes show that about one star in eighteen is double. With the spectroscope the number of stars recognized as "doubles" is about one in five or six.

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Sugar and alcohol can be obtained from the juice of the agave or century plant.

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Slices of rock are cut about a two hundred and fiftieth of an inch in thickness for examination under the microscope.

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DO YOU KNOW THAT -

During pasteurization or sterilization of bottles ranging from 4 to 64 ounces in sizes, from one to thirty in a thousand bottles are broken.

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Papyrus, on which the ancient Egyptians wrote books, is now again used as a paper making material.

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More than two-thirds of the current observations of astronomy are made photographically.

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The idea that the earth is a liquid globe with a solid crust only about 30 miles in thickness, first put forth by Descartes, prevailed until a generation or so ago. Lord Kelvin was the first to prove from tidal phenomena that the earth is really solid.

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DO YOU KNOW THAT-

Traces of vanadium and arsenic were found in the water from some deep wells in Buenos Aires.

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Six caves containing rich and important deposits of bat guano were recently discovered on the Island of Sardinia.

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Bacteria are being used to turn sugar cane, from which the sugar has been extracted, into an available nitrogenous fertilizer.

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From tea can be obtained tannic acid, protein, and a tasteless and odorless product used in the manufacture of shellac, varnish and artificial leather according to a Japanese patent.

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DO YOU KNOW THAT -

It is estimated that one-third of an inch is removed from the surface of marble monuments in a century by the acid-laden rain of towns.

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More than one-third of the known chemical elements have been discovered since the middle of the nineteenth century.

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Rape, turnip, false flax, white and black mustard, radish, poppy, sunflower, flax, and hemp are among the seeds that are raised in Germany for their fats and oils.

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Samples of soil taken only a hundred yards apart often show marked difference in physical and chemical properties.

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DO YOU KNOW THAT -

Imitation turquoises, known as "reconstructed turquoises," are made of finely powdered ivory deposited in a solution of copper.

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The modern corn crib, raised on posts, is modeled after those used by the Indians of the southern United States. From the Indians we learned to make such corn foods as hoe-cake, succotash, samp and hominy.

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Plans are being made in Paris to establish a regular airplane service next spring between Paris and Constantinople, with stops at Strasbourg, Prague, Budapest, and Bucharest.

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What is believed to be the highest temperature for growth in plants of higher order was recorded at Tucson, Arizona, and shows that some joints of prickly pear continued to elongate at a temperature of 133.7° Farenheit. When the temperature rose higher, elongation ceased, but resumed when later the temperature dropped again.

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DO YOU KNOW THAT -

Children's clothes, as well as lace curtains, can be fireproofed by soaking for five minutes in a solution of a pound of ammonium phosphate in a gallon of cold water. The solution, no more harmful than ordinary water, makes any article fireproof until washed or drenched with rain.

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Robert Fulton's pioneer steamboat, the "Clermont," was named after the estate of Robert Livingston on the Hudson. Livingston had been Fulton's financial backer in his earlier experiments with steamboats in France.

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More than one-tenth of the gold produced in the United States is obtained as a by-product in the smelting of copper and lead ores.

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The popping of corn was practiced in South America before the advent of the white man. Among some of the Indian tribes a specially shaped dish, with a depression in the center for the reception of the grains and a handle, was used in popping.

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