SCIENCE NEWS

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THE 200-INCH TELESCOPE OF THE CALIFORNIA INSTITUTE

TELESCOPIC power ten times as great as that given by the 100-inch reflecting telescope of the Mount Wilson Observatory, now the largest in the world, will be at the disposal of astronomers when the 200-inch reflector of the California Institute of Technology is completed. It will penetrate three times as far into space as the 100-inch, and bring into view a globular region of space thirty times the volume of that reached by present-day telescopes.

Work on the new instrument is now under way. A model of the telescope, based on a design that has been accepted tentatively, but may be greatly altered after further study, was placed on exhibition on October 19 at the building of the National Academy of Sciences in Washington.

Two miniature figures, on the same scale as the model, indicate the size of the finished instrument if this design is finally accepted. It will be about 85 feet high when pointing near the zenith, about the same height as a seven- or eight-story office building. The tube is supported in a fork, so that it may be pointed to any part of the sky. The fork is arranged to turn in a direction parallel with the axis of the earth. A powerful clock-drive will turn the instrument around this axis once a day, thereby keeping it pointed to the stars as they move across the sky. This arrangement is the same as in the usual equatorial mounting for astronomical telescopes.

In the present issue of *Harper's Magazine*, Dr. George Ellery Hale, honorary director of the Mount Wilson Observatory of the Carnegie Institution of Washington and chairman of the observatory council of the California Institute of Technology, describes the progress of the work on the telescope since it was started a year ago.

No actual construction work on the telescope proper has yet begun, but much necessary preliminary work has been accomplished. A tentative design for the telescope has been worked out. Plans have been completed for the astrophysical laboratory on the Pasadena campus, of the California Institute, which will be the headquarters of the astronomers who will use the telescope, measure the photographs taken with it and interpret them with the aid of laboratory experiments. Plans have also been made for the instrument shop where the smaller telescope parts and many accessory instruments will be constructed, and for the optical shop, where the huge mirror will be ground and figured. While these plans were being drawn, Mount Wilson astronomers have been engaging in a survey of a dozen possible sites for the new instrument.

Dr. Hale emphasizes the importance of choosing the best site for the telescope.

"We observe the stars from the depths of a turbulent atmosphere," he says, "which not only scatters and absorbs much of the light that reaches its upper levels, but so irregularly refracts the portion transmitted that the rays falling on the various parts of a large lens or mirror are rarely or never combined into a sharply defined and perfectly steady image.

"By selecting a site of high altitude, above the denser and more disturbed portion of the atmosphere, in a region but little affected by clouds and storms, we may greatly reduce these difficulties. In fact, the conditions on Mount Wilson are so favorable that on a very large proportion of the nights in the year the 100-inch Hooker telescope gives us a gain in light-collecting power over the 60-inch telescope fully in proportion to its greater aperture.

"The use of the larger instrument has thus resulted in many fundamental discoveries beyond the range of the smaller one, and has more than justified our most sanguine hopes. Moreover, we have direct observational evidence that on Mount Wilson a 200-inch telescope could be depended upon to show a further gain, in keeping with its increased size. The probabilities now are that we can find a still better site within a short distance of Pasadena."

THE ETHER DRIFT

SCIENCE still must answer the great and fundamental question: "Is there an ether?" And despite the many feats of the Einstein theories of relativity in explaining and predicting observed facts of physics, such as the way the planet Mercury moves in its orbit, they are seriously menaced by having one of their foundations pulled out from under them.

For Professor Dayton C. Miller has reported to the Optical Society of America meeting at Ithaca that he has during the past year laboriously repeated the ether drift experiments that he has been making during the last nine years in a Cleveland laboratory and on high Mount Wilson in California.

Again he finds an observed effect in the light path of his apparatus such as would be produced by a relative motion of the earth and the ether of about ten kilometers (six miles) per second. This is the same result that Dr. Miller has obtained during the past few years. In 1925 his paper on this work won the annual prize of the American Association for the Advancement of Science. This continued ability to obtain the same results over a period of years, whether the apparatus is at normal level in Cleveland or on a California mountain, makes Dr. Miller's results all the more important.

Nor does Dr. Miller feel that his experiments repudiate the famous Michelson-Morley experiments on ether drift performed in 1887. Prevalent opinion holds that this historic test showed that there is no ether drift, that there is no something filling all space, and it was upon this interpretation that Professor Albert Einstein based his special theory of relativity when he enunciated it in 1905. But Dr. Miller, studying the results of his latest experiments performed this year on the campus of the Case School of Applied Science, only about 300 feet from the location of the original Michelson-Morley interferometer of 1887, finds that his results showing the solar system moving through space "fully agree with and confirm the

original Michelson-Morley observations, although the present interpretation is different.''

In the 1887 Michelson-Morley experiment there was discovered a slight difference in the time that it took light to travel over two paths, one at right angles to the other. But this was attributed to experimental errors, to those slight deviations that enter into all observations. Dr. Miller, by performing hundreds of experiments and by improving the details of the ether-drift interferometer, has by his results demonstrated that the observational differences of the original experiments and his many later tests are real and not due to error in the apparatus. Such refinements as shock-absorbing pads on the supporting piers and extreme precautions to eliminate temperature differences were taken in this year's experiments. The interferometer uses the interference of light waves to measure far more accurately than any mechanical means. Dr. Miller's instrument gives numerical results reliable to the hundredth part of a wave-length of light, although the length of the light path is 130,000,000 wave-lengths. He can detect a relative motion of earth and ether a twentieth that which he actually observed.

The discovered motion of six miles a second is not a mere earthly phenomenon, but a cosmic one. It is fixed with relation to sidereal time, that is, it is toward a fixed place in space. The earth and its millions and the whole solar system is rushing, Dr. Miller declares, ''toward the point having a right ascension of 17 hours.''

How are the scientists to reconcile with their theories this well-tested motion that the ether-drift experiments demonstrate? Dr. Miller says: ''It seems impossible at the present time to account for a cosmic effect of this small magnitude and it will be necessary to continue these experiments and to coordinate them with others before an acceptable theory can be propounded.''

THE SUPERSONIC SUBMARINE FINDER

RUMORS that the United States and other powers are willing to abandon submarines because a sure means has been perfected for locating them under water, even when ''sleeping'' on the bottom, seem to be without solid foundation. Information available indicates that the various types of supersonic listening gear, while moderately effective, are of too short range to be reckoned as generally effective from a military view-point. If, therefore, submarine construction is abandoned or restricted in the immediate future it will be a deliberate move in a peace program rather than the abandonment of an arm because it has lost its fighting value.

Statements have gained circulation lately that the British Admiralty has perfected a device for locating submarines at a distance. Such a device, if perfected, would without doubt mean the end of undersea fighting craft, for such boats are easy to destroy once they are located. But the range of the listening gear used in all navies of the world so far as known is to be measured in mere hundreds of yards rather than in miles, so that unless the sea were literally peppered with scout boats many submarines would be bound to escape detection.

Most of the locators of ''silent'' submarines known to military students at Washington depend on the propagation through the water of beams of sound-waves so short as to be inaudible to human ears—the so-called supersonic or ultrasonic waves. These can be produced from electrically excited crystals of quartz, somewhat similar to those used in radio broadcast stations for frequency control, but larger. These waves differ from ordinary sound-waves in that they can be directed in a comparatively narrow beam, like the rays of a searchlight. They reflect as echoes from solid objects, and parts of these echoes are picked up by the listening gear on scout ships, amplified and interpreted by observers. Similar devices, using audible sound-waves, have been used for a long time in the well-known sonic depth-finding apparatus.

Work on supersonic submarine locators began during the world war, and has been carried on ever since, particularly by France, Great Britain and the United States. During the war their information was more or less pooled, but since then the researches have continued independently in each country. It is believed that progress in this country has been about equal to that abroad, although necessarily most of the information about the technical details of the apparatus is kept confidential.

From time to time wild stories get into circulation crediting supersonics with destructive power verging on the supernatural. These seem to be based on the experimental work on extremely short-length supersonic waves carried on by Professor R. W. Wood, of the Johns Hopkins University, and Alfred L. Loomis, in the latter's private laboratory at Tuxedo Park, N. Y. This work, following observations made by Professor Wood in the laboratory of P. Langevin, at Toulon, during the war, has shown that it is possible to kill small animals and microscopic plants with ''rays'' of supersonic waves in water. But they do not kill anything bigger than a tadpole or a goldfish, and they are never used in more than half a pint or so of water. So that using them to sink a submarine in the ocean, or to kill her crew at a distance of a mile, is quite out of the question. The significance of the supersonic researches of Professor Wood and Mr. Loomis is not military, but purely scientific.

TRACHOMA AND BLINDNESS

THE chief cause of the nearly two and one half million cases of blindness existing in the world to-day is trachoma, according to a statement made by Lewis H. Carris, managing director of the National Society for the Prevention of Blindness, on his return from a world conference on blindness held at The Hague.

This disease is found in nearly every part of the globe, but it is at its worst in Oriental countries. It is most prevalent in Egypt and along the borders of the Mediterranean Sea, in Palestine, China, the Balkan States, India, the hot sections of Brazil and in our country among the inhabitants of the Appalachian and Ozark Mountain districts and among American Indians.

Trachoma is a highly contagious disease. The roller towel has been the cause of many epidemics of the dis-

ease in industrial plants. A common family towel is also a potent spreader of the disease among members of the same household. Poverty, crowding and unsanitary living conditions are important factors in the contraction and spread of trachoma.

The disease causes redness, painful inflammation and granular growths, looking something like sago, within the lids. These irritate the cornea, producing ulcers and later scars. The scar formation may produce an opaque layer covering the pupil which results in loss of sight.

In individual cases the disease may be checked by proper treatment, but trachoma is so wide-spread that it can not be entirely controlled until more is known of its cause. Dr. Hideyo Noguchi, working at the Rockefeller Institute for Medical Research, thought that he had found the organism or germ causing trachoma. Since his death the work has been continued, but further results have not yet been announced. Other investigators have considered diet a causative or predisposing factor.

The United States has for many years refused admission to immigrants showing symptoms of trachoma. The U. S. Public Health Service has been conducting extensive studies of the disease in the sections of this country where it is prevalent.

The other major causes of blindness are venereal diseases, babies' sore eyes, smallpox, glaucoma, congenital defects and accidents.

THE DEVELOPMENT OF INFANTS

PSYCHOLOGISTS studying the behavior of young children have succeeded in giving a baby training that would alter the course of its development and yet they have been able to see what it would have been like if it had never been trained. This magic has been brought about by the Yale Psycho-Clinic, where Dr. Arnold Gesell and Dr. Helen Thompson have observed identical twin girls from the age of one month up to the age of eighteen months. Reporting their unusual experiment in the *Genetic Psychology Monographs*, the psychologists say that it is doubtful if prolonged search could have secured for comparative study twins more extensively and profoundly alike than these. The blue-eyed blonde babies respond with remarkable similarity of behavior to almost any situation. In refusing or objecting, each twin's gesture is to turn the body slightly to the right and bend the left arm across the chest. When placed back to back and observed for several hours, their manner of handling a bell, spoon and other objects was strikingly similar.

For six weeks the psychologists gave one twin girl, T, a chance to practice climbing a set of five steps every day. Meanwhile, the other twin, C, had no such opportunity to learn the new activity. In the first three weeks of climbing lessons Twin T had to be frequently assisted. At the end of six weeks, when she was 52 weeks old, she climbed the steps in 26 seconds and was an enthusiastic climber. Yet when Twin C was introduced to the steps at the age of 53 weeks, she proceeded to climb the staircase without training or aid, taking only 45 seconds. At the age of 56 weeks T was climbing the steps in 11 seconds and C in 14.

Twin T was also given practice in handling cubes, the psychologists report, but her added early experience did not give her any advantage when Twin C was presented with three little blocks to bang with and to pile on top of one another.

The experience of the twins shows, according to Dr. Gesell and Dr. Thompson, that a child begins to climb and to build towers with his blocks when his nerve structures are ripe for such activities. Exercise may not even hasten the actual appearance of such reactions in a young child. The experience gained by early practice tends to be supplanted or modified by the process of the child's maturation. If it were not so, the infant could scarcely grow. Twins identically alike offer a promising field for psychologists to study the difficult problems of human growth.

ITEMS

WHEN a farmer plants a clover crop on a piece of poor land for the purpose of enriching it, and later on puts the field into some other crop, he is only duplicating a process that happens without human assistance wherever there are raw or impoverished soils. This is indicated by the results of observations by Dr. Elmer Campbell, of Transylvania College, published in the scientific journal *Ecology*. Dr. Campbell studied a series of raw gravel exposures in Indiana and also a number of exhausted and abandoned fields in various parts of the South. He found that in all cases the larger proportion of legumes in the total vegetation was found on the poorer soils, and that as legumes increased the nitrogen content they were gradually replaced by other wild plants. For instance, on the Indiana gravel he found the plant population to be 100 per cent. sweet clover on a three-year-old exposure, but on a ten-year-old strip sweet clover made up only 20 per cent. of all the plants present. In the South the predominant wild legume of poor lands was lespedeza.

AN automobile dumbwaiter is the newest suggestion for solving the parking problem. As demonstrated by Westinghouse engineers recently, the car is driven onto a platform, a button is pressed, and the car is whisked up out of sight. An empty platform appears for the next car. When the owner wishes to retrieve his car, he presses the proper button, and the car is immediately delivered to him at ground level, ready to be driven away. Occupying as much space as a small double garage, the new machine can be built in any capacity desired, it was stated, and installed in old or new buildings.

A WAY to irradiate chocolate so that its flavor is not impaired has been discovered by two Austrian scientists, Drs. S. Reid and H. Krasso. Rats fed on this chocolate gained in weight. Patients enjoyed it and showed improvement in appetite and general condition and a gain in weight. The chocolate was fed as milk chocolate and as a beverage made with milk. Most of the patients to whom this chocolate was given were suffering from tuberculosis. A few suffering from secondary anemia showed improvement in the condition of their blood. Dr. Krasso also suggests that irradiated chocolate might prove valuable in the treatment of diseases of the bones, such as rickets.