SCIENCE NEWS

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DISCOVERY OF THE FAINTEST STAR

THE discovery of a star of such extremely low luminosity that a million stars like it would be needed to equal the sun's brilliance has been anounced from the McDonald Observatory of the Universities of Chicago and Texas.

This important contribution to astronomical observations follows closely the discovery at the same observatory of an atmosphere of methane around Saturn's largest satellite.

The present discovery was made by Dr. G. Van Biesbroeck, of the Yerkes Observatory, when comparing two plates taken at the prime focus of the 82-inch McDonald Observatory reflecting telescope. On these plates the star known as "BD plus 4 degrees 4048" is found to have a companion star at a distance of 74 seconds of arc away.

The companion is identified by the fact that it shares the apparent motion of the brighter star across the sky; the companion itself is of the 18th magnitude as seen on the plate.

In order to determine the intrinsic brightness of this star, however, its distance from us must be known; this is of course practically the same as that of the primary star. This star happens to be rather close to the sun as astronomical distances go, its distance being about six parsecs, or 19½ light years. In other words, light traveling at some 186,000 miles per second requires nearly 20 years to reach us from that star.

However, the nearest star is no nearer to the sun than one-fifth of this distance. The faint companion star's intrinsic luminosity comes out very faint; it is expressed by astronomers as being of absolute magnitude 19 on red plates. This makes it three magnitudes or about 15 times fainter than the faintest star previously observed, Wolf 359, which has a red absolute magnitude of 16.

Wolf 359 is only eight light-years away, so its earlier discovery is not surprising. The sun is on the order of a million times as bright as the new faint star.

In making his announcement, Dr. Van Biesbroeck calls attention to the fact that if this star and Jupiter were placed at the same distance Jupiter at its brightest would still be seven magnitudes fainter than the companion of the star known as "BD plus 4 degrees 4048." This is a factor of about 600 times and makes it fairly certain that the faint star is shining by its own light rather than reflecting light from its primary; whereas Jupiter shines only by reflected sunlight.

Jupiter is the largest planet in the solar system, so it is also one of the brightest, even though it is five times as far from the sun as the earth is. The new faint companion star, however, is some 440 times the earth-sun distance from its principal star which makes it quite certain that its light is not reflected. At present nothing can be said about the mass of this newly found faint star but it must evidently be rather small unless it is some unusual sort of highly condensed star. Ordinarily the mass of a star is closely related to its luminosity.

The importance of this problem is its relation to that of the recently discovered stars of very small mass such as the invisible companion of 61 Cygni. This latter star discovered by Dr. K. Aa. Strand of Swarthmore has a mass only 16 times that of Jupiter, but Dr. Strand's observations reveal nothing of its brightness. The small star is invisible, and is detected by its gravitational effect on the primary star around which it revolves.

Is Van Biesbroeck's new star of as small mass as Dr. Strand's? If that question can be answered considerable light will be thrown upon whether to call such small and faint objects stars or planets. Astronomers are at present undecided which term ought to apply, but discoveries such as Dr. Van Biesbroeck's are rapidly clearing up the matter. It is possible that the distinction between planet and star may some day almost cease to be plausible.

Included in the information supplied to the Harvard clearing house by Dr. Van Biesbroeck for distribution to American and foreign astronomers is that the position angle of the faint star is 150 degrees; that the common proper motion is 1.45 seconds toward 204 degrees; that the parallax is 0.17 seconds and the projected separation is 440 astronomical units.

STANDARD MUSICAL PITCH

MUSICIANS and manufacturers who want to check pitch can now tune in during the night with their shortwave sets to 2,500 kilocycles and get a musical sound guaranteed by the National Bureau of Standards to be pure 440 cycles per second, which is A above middle C in the musical scale. This radio frequency, 2,500 kilocycles per second, at night, is an addition, effective on February 1, to the standard frequency broadcast service of the Bureau.

Beginning the same date, the pulse on the 59th second of every minute will be omitted. This government service, continuous day and night, broadcasts standard frequencies and standard time intervals from the Bureau's radio station near Washington, WWV. It makes the national standard of frequency widely available. This is of value in scientific and other measurements requiring an accurate frequency.

The standard frequency broadcast service of the bureau includes standard radio frequencies, standard time intervals accurately synchronized with basic time signals, standard audio frequencies and standard musical pitch.

At least three radio carrier frequencies will now be on the air at all times to insure reliable coverage of the United States and other parts of the world. Two frequencies, 5,000 and 10,000 kilocycles per second, are on continuously day and night. A 15,000 kilocycles-per-second frequency is on the air from 7:00 A.M. to 7:00 P.M., with the additional frequency to be used, 2,500 kilocycles per second, from 7:00 P.M. to 9:00 A.M.

Two standard audio frequencies, 440 cycles per second

and 4,000 cycles per second, are broadcast on the radio frequencies of 5,000, 10,000 and 15,000 kilocycles. The audio frequency 440 cycles only is broadcast on the 2,500 kilocycles. The 440 cycles per second is the standard musical pitch; the 4,000 cycles per second is a useful standard audio frequency for laboratory measurements.

B VITAMINS

AT least two vitamins of the B complex group, riboflavin and the pellagra-preventive niacin, appear to be factors necessary for the production and regeneration of the blood in the animal body, according to reports to the *Journal of Biological Chemistry*.

A stunting of the red blood cells that are constantly being produced by the blood-forming organs, and a consequent mild anemia, result from a synthetic diet containing all the known essential nutrients except riboflavin, was found by Dr. C. A. Elvehjem and his associates of the University of Wisconsin. This anemia, produced in dogs, is a direct result of the riboflavin deficiency and readily responds to a corrected diet containing adequate amounts of riboflavin. Riboflavin is indispensable for normal growth and development. The results of these experiments therefore "suggest that in growing dogs there is a competitive need for riboflavin for growth and hemoglobin production."

It has also been suspected for some time that anemia, at least as found in pellagrins, is in some way associated with niacin deficiency. Dr. Philip Handler and Dr. William P. Featherston, of the School of Medicine of Duke University, show, apparently for the first time, that the anemia in pellagrous dogs is specifically due to this deficiency and can be corrected only by the administration of adequate amounts of this vitamin. The red blood cells in this anemia are large but below normal in number and hemoglobin content.

The dietary and other factors that are known to be involved or helpful in the production of blood cells in the body, such as iron, protein, glucose, hemoglobin, the anti-pernicious anemia factor of liver extract, xanthopterin and excessive amounts of cobalt were without effect when administered to the pellagrous and anemic animals. They were successfully treated, however, with niacin.

Mature red blood corpuscles are not true cells since they do not have nuclei. In the early formative stages, however, they do have nuclei. It is the theory of the authors that niacin is necessary for the proper production and maturation of these blood cells. This vitamin is known to play an important rôle in the respiration of all cells of the body. The lifetime of blood cells appears to be very short and the rate of turnover is quite rapid. Consequently the requirements of niacin for the manufacture of blood cells might be correspondingly great. A niacin deficiency, besides producing the usual symptoms of pellagra, might also lead to anemia because of the inadequate supply of this vitamin for development of the red blood cells in the early stages.

ITEMS

THE appearance of a small sunspot on Saturday, January 22, marks the end of the longest period without a sunspot of appreciable size since the early 1930's. The sun's surface has been unmarred by any identified spots since December 25. A few faint markings were discovered on plates made at the Mount Wilson Observatory the middle of last week, but were not found on plates made at the U. S. Naval Observatory. Thus 28 days have elapsed since the last sizable sunspot was visible.

GREAT strides have been made during this war in the progress of welding from an art to a science, according to W. P. Eddy, Jr., of the General Motors Corporation, who spoke at the meeting of the Society of Automotive Engineers. Two of the outstanding advances are spot-welding and arc-welding of armor and other highly stressed parts of carbon and alloy steels previously considered unweldable, at least for primary structures. New automatic arc-welding equipment has been devised to weld carbon and alloy steels with high degree of uniformity and at far faster rates than obtainable by manual welding. In both automatic and manual arc-welding of hardenable steels, use of austenitic welding rod was first developed. Steel in these electrodes contained a total of 30 per cent. or more of alloying nickel, chromium, manganese, molybdenum or other metals. Recent work resulted in the development, for automatic welding, of a low-alloy steel electrode containing only a tenth of the total alloy content formerly considered necessary. A low-alloy rod for manual welding has still more recently been developed. Mr. Eddy discussed the effects of other war-time developments pertaining to steel on future steels. The more important of them, he said, have been made in fatigue endurance, heat treatment, castings, alloy evaluation, hardenability and special addition agent steels sometimes called needled steels. These needled steels are made, usually in open hearth furnaces, by normal practices, with a minute percentage of one of the special agents added. These agents are of various composition but all contain boron.

NEW war standard specifications for radio dry electrolytic capacitators of the home receiver replacement type, and for dimensions for radio-frequency thermocouple converters, have been announced by the American Standards Association. The dry electrolytic capacitators chosen represent the least number of units necessary at this time for servicing the great majority of home radio receivers. The minimum performance requirements are designed to furnish capacitators which will use as small an amount of strategic materials as possible, will not restrict production, and will prove satisfactory from an electrical and service standpoint. Thermocouple converters covered by the new standards are being manufactured widely in the trade. It is expected that the standards will be used by the armed forces in the design of new equipment and for replacement parts wherever possible. It is estimated they cover 90 per cent. of the thermocouple converters now used in radio and electronic equipment. The converters will be interchangeable for use with radio-frequency currents from 120 milliamperes to 10 amperes inclusive.