GENERAL SCIENCE

Astronomer Finds Evidence of Star That "Wasn't There"

Systematic Fluctuation in Movement of Double Star Interpreted as Pointing to an Invisible Companion

THOUGH it "wasn't there" in his photographs, Dr. K. Aa. Strand, of the Sproul Observatory of Swarthmore College, has found a previously unknown star from the study of these same photographs. He announced his discovery at the meeting of the American Philosophical Society in Philadelphia.

The star is an invisible companion to a well-known double star, Zeta Aquarii. Member of the constellation of Aquarius, the water-carrier, this consists of two separate suns, which revolve around each other once in 400 years. Though first observations of them were made in 1779 by Sir William Herschel, Dr. Strand's photographic measurements are the most accurate so far. They are nearly ten times as precise as the best made hitherto.

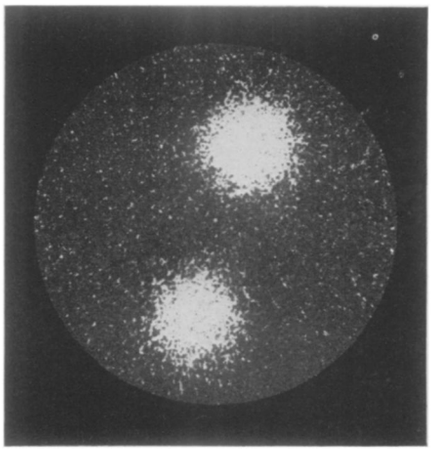
In correlating these with the earlier figures, he found that the movement of the two stars was not uniform, but that there was a regular fluctuation from the expected motion, over a period of 25 years.

These deviations, declared Dr. Strand, "are entirely too large and too regular to be explained as systematic and accidental errors of observation, but they are satisfactorily interpreted as perturbations caused by a third invisible member of the system." That is, the gravitational pull of the unseen star pulls the others back and forth as it goes around them.

He concludes that the invisible companion has about one-half the mass of the sun, while that of the entire system is four times the sun's mass. Its distance is about 85 light years. The two bright stars, which can be seen in a telescope, are separated by a distance about 90 times that between the sun and earth. The third star revolves around the brighter of the visible pair, at about 12 times the sun-earth distance, or about 1,100,000,000 miles.

Only twice before, said Dr. Strand, has a dark companion been found in such a way around a similar double star. The first such discovery was made in 1881, of a star in the constellation of Cancer, the crab; and the second was in 1905 of one in the great bear, Ursa Major.

Science News Letter, November 30, 1940



STAR THAT WASN'T THERE

It doesn't show in this picture which portrays two suns that circle round each other and that now have been found to have an invisible companion. Magnified about 180 diameters, the grains of the photographic emulsion show as fine specks.

Clue to Cosmic Rays

A NEW clue to the exact nature of the mysterious cosmic rays was contained in a paper presented at the meeting of the American Philosophical Society by Dr. Serge A. Korff, of the Bartol Research Foundation of the Franklin Institute.

Cosmic rays, as observed at the earth's surface, are made up of several different kinds of particles, including neutrons, which have no electrical charge; electrons, which have a charge, and mesotrons, which are about 200 times as heavy.

Sometimes the electrons come in showers, which are bigger the higher the altitude at which they are observed. These are supposed to be caused by the action of other electrons on the nuclei of atoms in the atmosphere. Dr. Korff has found that the number of neutrons increases with altitude in about the same way as the cosmic-ray showers, and that neutrons are often associated with the showers.

Thus, he advanced the suggestion that the neutrons are also produced by a disintegration of the atomic nuclei in the atmosphere. Observations of cosmic rays made at sea level and also on top of Mt. Washington show them closely in accord with predictions based on this theory.

Science News Letter, November 30, 1940

Study Lowest Temperatures

THE physics laboratory of Columbia University will soon be one of the few spots in the world where the lowest possible temperatures, hundreds of degrees below zero, can be attained. Dr. Henry A. Boorse, in charge of this work, gave details of the new equipment, made possible in part by a grant from the American Philosophical Society.

This, he said, "will place at our disposal the complete range of temperature from the ice point to within a few hundredths of a degree of the absolute zero." The latter temperature, 459.72 degrees below zero of the Fahrenheit scale, is the point at which all molecular movement ceases. Below this it is impossible ever to go.

Many of the researches will be concerned with the strange behavior of liquid helium, at temperatures of only a degree or two above absolute zero. For example, if a beaker containing some is just partially immersed in a bath of the same liquid, it will creep up over the edge, until the levels are the same. Many metals at the low temperatures cease to have electrical resistance, while with some, notably gold, the resistance vastly increases when the very lowest temperatures are reached.

Science News Letter, November 30, 1940

"Solid" Bone Is Plastic

BONE is by no means the solid, unyielding, unchanging stuff it has long been assumed to be, Dr. Charles B. Davenport, Carnegie Institution of Washington geneticist, told the American Philosophical Society. Instead, it is a decidedly plastic material, molding and remolding itself readily, though slowly, in response to external conditions.

Dr. Davenport cited especially the behavior of the slender, transverse bracing rods that are found in many parts of the skeleton, especially the limb bones. Because they resemble the bracing timbers of a house or bridge not only in form but in function, they have been given the name "trabeculae," which means "little beams."

If a broken bone is badly set, so that muscular strains no longer affect it in the

same directions, new trabeculae will be formed within it, thrusting in the lines of the new strains, Dr. Davenport stated. He also cited the cases of two crippled young women, one of whom had been bedridden all her life, the other since she was ten years old. The first patient has a heel-bone shaped roughly like that of a normal child but without the properly directed trabeculae. The second, who walked for a short time before she became crippled, has a nearly normally shaped heel-bone, but only a few directed trabeculae.

"The conclusion seems to be justified," said Dr. Davenport, "that the bone-forming cells respond to directive thrusts and pulls that are made upon normally functioning bones by forming the trabeculae in adaptive positions. Thus the bone cells are as truly responsive as muscle cells, . . . but respond to different stimuli in a different way."

Science News Letter, November 30, 1940

Rare "Flying" Mammal

ONE of the rarest of tropical animals, the colugo or flying lemur of the Philippines and the East Indies, was described by Prof. Glenn L. Jepsen of Princeton University, who discussed especially the question of its possible kinship to the bats.

"It is not a lemur and it does not fly," Prof. Jepsen told the Philosophical Society. Instead, he explained, it makes long glides, like a flying-squirrel, aided by a membrane that runs from its neck to its legs and thence to the tail, making a very effective parachute. It also has webbed toes, which add to its supporting surface. An exceedingly curious feature is the comb-like structure of its front teeth.

Some years ago, fossils from 50-million-year-old early Tertiary beds in Wyoming and Montana proved to be of animals related to the so-called flying lemurs but even more primitive. Comparisons of these with the bones of their modern relatives of the Asiatic tropics suggest, Prof. Jepsen reported, "that the 'flying lemurs' are an extremely ancient line, of limited ecologic latitude, and that they are only remotely if at all related to the bats."

Science News Letter, November 30, 1940

By aid of bleaching powers of sodium chlorite—chemical relative of common salt—America expects to make *wood pulp* comparable in quality to the Scandinavian.

RESOURCES

World's Silk Situation Snarled As If Kitten Had Ball

Japan, With Silk in Abundance, Forbids Weaving of Cotton or Wool Without Mixture of 20% Silk

WHILE American women unconcernedly go on wearing silk stockings, the world's silk situation grows as tangled as though some lively kitten had got the ball.

In Japan, worry over possible loss of such silk customers as the United States and India is leading to talk of finding new customers, presumably in Latin America.

Still the world's leading silk producer, Japan finds itself these days in the strange position of using more of its own silk than it can sell even to its perennial number one silk buyer, the United States.

With silk on its hands and a shortage of clothing, Japan ordered its people on October 1 to spin or weave no more cotton, wool, or rayon without mixing 20% of silk with the fiber. This is expected to use up an additional 100,000 bales of silk in a year, and will probably bring Japan's own consumption of silk up toward 500,000 bales. The United States last year bought about 384,000 bales, and has taken less this year.

Paradoxically, Japanese are forbidden the luxury of fine grade silks. Such materials are to be made for the foreign trade. They will thus bring in much-wanted gold for buying war material.

A new job for silkworms is even among the ways and means Japan is evolving for meeting her silk worries. Quantities of worms are to be used, according to plan, in making wool substitutes. This will help some of the 2,000,000 farm families that customarily raise silkworms among other products, and increase supplies of warm material.

Meanwhile, English women are buying no more silk hosiery or knit silk underwear after December 1, to conserve supplies of silk for military use.

Italy, cut off from selling silk to the United States since August, hopefully stores in warehouses silk we would normally buy. The silk is being reeled the way United States manufacturers like it, all ready in case —. Compared with Japan's major silk production, the silk on Italy's hands is not very great, but it is important to Italy.

If the United States should take the drastic step of cutting off Japanese silk imports, the break in trade would be more serious for Japan than for the United States.

Silk is listed as a strategic material, which this country does not produce and which it needs for such military purposes as parachutes and powder bags. Experiments with Nylon, Vinyon, and other synthetic textiles, however, have given reassuring results that we are not so dependent on silkworms after all.

So far as silk hosiery wearers go—and they are now consumers of most of the silk America gets from Japan—they would find themselves meeting a "silkless" era by various adjustments. Nylon, which has been stepped up in production beyond expectations, is a partial answer to the "what would we do without Japanese silk?" question. Other synthetics, and probably synthetics yet to be invented and improved, are part of the answer.

New fashions, such as anklets, sheer cotton hosiery, possibly a bare leg fad, would figure in the developments.

Some silk, also, can be had from sources other than Japan. China sent the United States over 15% of the silk we imported in the first nine months of 1940, a step up from less than 8% in similar months of last year.

Tropical America, too, may yet establish a silk industry. Ecuador is seen by some agriculturists as one favorable region, because of the dry, cool climate in high altitudes and the low-wage scale of farm labor.

The United States, which has tried to make silk production a paying crop since colonial days, continues to stub its toe against the economic factor. Caring for silkworms continues to be a farm and home business for low-paid workers. People who ask why Puerto Rico would not be a good place for a silk industry forget that the Wages and Hours law applies there as in continental United States.

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