

SCIENCE NEWS

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THE LAW OF GRAVITATION

IN this two hundred and ninety-ninth year since the birth of Sir Isaac Newton, which occurred Christmas day, 1642, according to the Old Style Calendar then in use in England, his law of gravitation is still on trial, but is winning, according to a report made by Dr. Fritz Zwicky, professor of theoretical physics at the California Institute of Technology, to the Astronomical Society of the Pacific.

The question is not whether the precise form of the law is Newton's or Einstein's, but the extent of its application whatever its form. Newton believed his law to be universal. "Every particle of matter in the universe attracts every other particle . . ." was Newton's formulation.

But it was a small universe in Newton's time. The extension of the force of gravity to the moon, and its action in producing the tides, were demonstrated by Newton himself. Its application to the planets and their satellites was readily verified in his time. Its application to comets was firmly established by the return of Halley's comet as predicted, seventy-seven years after the calculations were made.

But all this concerns only our immediate solar system, a small speck in a vast universe of stars. Do the stars also obey this law? To answer this question took more time. Double stars revolve about each other, but often require many years to complete a revolution, and are so far distant that the changes of position as seen in the telescope are of microscopic dimensions. It was not until 1830, more than a century and a half after the publication of Newton's law, that Savary was able to show that the motions of these bodies are elliptical and the law of gravitation therefore applies.

But these stars belong to our own galactic or milky way system, a huge conglomeration of stars, clusters and gaseous bodies, 100,000 light years in diameter and about 20,000 light years thick at the center. It is only one among billions of others like it scattered about in a great universe of galaxies that extends at least 100,000,000 light years in every direction. Do the same laws apply in these distant galaxies or spiral nebulae?

This is a much harder question to answer than any of the others, and the answer can not yet be regarded as complete. We believe that our own nebula or galaxy is revolving, but it takes 200,000 years to make one turn. Motions have been observed in our neighboring galaxy, Andromeda, only 870,000 light years away, which might be part of such a revolution, but it is too early to say.

Strangely enough, Dr. Zwicky finds the best evidence for the operation of gravity over inter-galactic distances, measured in millions of light years instead of millions of miles as in our solar system, in certain clusters of nebulae that occur. Imagine, a cluster of universes each one like our great milky way! One of these in the constellation of Coma is 45,000,000 light years distant and about 5,000,000 light years in diameter. Dr. Zwicky estimates that it contains over 2,000 galaxies; 650 have been counted.

The distribution of these galaxies within the sphere they occupy can be calculated on the basis of Newton's law of gravitation, and Dr. Zwicky finds that the actual distribution corresponds very nearly with that predicted by the law. Incidentally these clusters of nebulae could not have settled down to their present state in the short time of less than 10,000,000,000 years allowed by the advocates of the expanding universe. Besides supporting the general validity of Newton's law of gravitation, he says they also suggest that the universe is not expanding.

ECLIPSE OF THE STAR ALDEBARAN

IF, during the night of Monday, October 26, you see the moon, a few days past the full phase, approaching the bright star Aldebaran in the constellation of Taurus the bull, just keep on watching. You will be rewarded with a view of an occultation, which is what the astronomer calls an "eclipse" of a star by the moon.

The moon moves around the sky once a month from west to east. From new to full, the dark side is ahead, and from full to new the bright limb, on which the sun is shining, is in advance. Consequently when Aldebaran is occulted, the bright edge will cover the star. A pair of binoculars will make it easier to see. When, an hour or so later, the star emerges, its reappearance will be from behind the dark part of the moon. It will disappear and return to view instantaneously. There is no atmospheric layer around the moon to cause partial absorption of the star's light, and to make the star brighten gradually as the eclipse ends.

The exact times of the occultation are different in different parts of the country, but the Nautical Almanac Office of the U. S. Naval Observatory has worked them out for Washington and for three other stations. For Washington, the star disappears (on Oct. 27) at 2:11 A.M., EWT, and reappears at 3:37, EWT. For a location in western Massachusetts, the times are 2:23 and 3:51 A.M., EWT. For southern Illinois they are 12:46 and 2:11 A.M., CWT. Southern California will see the occultation start at 10:17 P.M., PWT, and end at 11:21 P.M., PWT, on the 26th.

Astronomers will watch this, as they do other occultations, in order to time it and to check accurately the movements of the moon. Occultations occur nightly, but those of a bright star are considerably rarer. Aldebaran is the brightest star that can ever be occulted.

ALLOYS OF METALS

A NEW method of making alloys of metals that do not mix when melted, and therefore can not be alloyed in this manner, was described at the Cleveland meeting of the American Society for Metals in a paper by M. L. Samuels, A. R. Elsea and K. Grube, research metallurgists of the Battelle Memorial Institute of Columbus, Ohio.

For example, aluminum and lead when melted do not dissolve in each other. However well the mixture is stirred, when it solidifies nearly all the lead is found at the bottom and nearly all the aluminum on the top, since lead is more than four times as heavy as aluminum.

But aluminum and tin do mix well when melted. On cooling, the aluminum, having the higher melting point, solidifies first in tree-like forms that interlace throughout the mixture. The spaces between are filled with the still molten tin. On further cooling, the tin solidifies and an alloy is produced in which the two metals are well and uniformly mixed throughout the mass.

It was found that this aluminum-tin alloy can be converted into an equally good aluminum-lead alloy by displacing the tin with lead. To do this, the alloy is heated in a pot to a temperature which melts the tin but not the aluminum. Molten lead is then poured on the top, and seeps into the metal, pushing the tin before it. The latter runs out through a hole in the bottom of the pot. In this way, an aluminum-lead alloy is produced having the same intermixture of metals that the aluminum-tin alloy had.

The method is applicable not only to metals that do not mix at all, but also to those that do not mix well enough to produce a good alloy, thus opening the way to improving these alloys. Thus copper and tin, when the tin content is high, do not mix well. By first making an alloy of copper and bismuth, and later replacing the bismuth with tin, a superior and hard alloy was produced. In fact, a number of impossible alloys were produced and several difficult ones were improved.

MAHOGANY TREES

MAHOGANY may come from cultivated forests of African trees grown in Florida. Experimental plantings of Rhodesian mahogany trees on the grounds of the subtropical experiment station of the University of Florida, near Homestead, are catching up in height with native fast-growing pines twice their age, have trunks twice the diameter of pines as old as themselves, and appear to be forming wood four or five times as fast.

On the strength of this performance, S. J. Lynch and H. S. Wolfe, of the Experiment Station staff, express the opinion that they appear to be the most promising hardwoods for reforestation in South Florida that have been tested by the Sub-Tropical Experiment Station.

The trees belong to one of two African genera of mahoganies, and are known botanically as *Khaya nyasica*. To distinguish them from other African mahogany species, it is proposed to call this species East African or Rhodesian mahogany. The African mahoganies generally are closely related to the American genus, *Swietenia*.

The oldest trees in the plantings, although set out in rather unpromising-looking sites only twelve years ago, already have seven- to eight-inch trunks and average 40 feet in height. Although distinctly tropical in origin, they have survived several cold spells, including one freeze when the temperature dropped to 27 degrees Fahrenheit. So far, the trees have not been attacked by insect pests or diseases; but botanists are chary about claiming immunity for them on that score.

RED AND VIOLET SNOW

FIELDS of red and purple snow in the Northland are due to microscopic plants. These single-celled algae, one of the most primitive groups of living things, were investigated by Erzsébet Kol, a Hungarian woman working under a Smithsonian fellowship. Her report of the vivid

“blooms” in Alaskan mountain ranges has been published by the Smithsonian Institution. In this forbidding Arctic environment, she found nearly fifty examples of the tiny plants living in almost infinite numbers on perpetual ice and snow.

After collecting living specimens, Miss Kol went to her laboratory high in the Swiss Alps where she planned to cultivate and study this strange form of life. War has now severed communication with her. Except for news of the loss of her living specimens, no word has been received on how the war has affected the project.

Previous reports indicated that these algae vary in character. One wouldn't live on ice; another wouldn't live on snow. And there are striking changes in types, depending on whether surrounding mountain slopes are acid or alkaline in composition. This is probably due to their reliance on air-borne particles of decomposing and shattered rock for food. Dust dissolves slowly in the moisture on snow or ice surfaces, providing the minerals essential for life.

The snow and ice plants, it is believed, serve as the chief food for some other form of life, which in turn supports higher forms. However, the life cycle of the vividly colored organisms remains unknown.

INDIAN SUMMER

THE first sharp frosts came early this year over a wide stretch of this country; Indian summer is here correspondingly soon. The quiet, warm autumn days, with calm air or, at most, moderate, drying winds, are good for hastening the maturing of the crops. They dry the last surplus water out of corn, beans and other seed crops, mellow late apples and pears, and put the finishing touches on pumpkins and hard-shelled squashes left orphaned by their frost-killed vines.

There is no fixed date for the arrival of Indian summer, no definite duration for the season. It is not even necessary that a killing frost come first, though that is a usual preliminary. Any warm, quiet spell, following cool or chill fall weather, may be called Indian summer. In some fortunate falls there may be more than one such season.

Meteorological background for Indian summer is a “stalled” high-pressure area somewhere in the Southeast, with a large area of low pressure backed up in or near the Yukon valley. There will then be little air movement off the main body of the continent, and even the low-angled autumn sun can warm up the air. Sometimes Indian summer temperatures rival those of actual summer: 90-degree days are not uncommon, though nights are always cool.

Only in the English-speaking parts of North America is the name Indian summer used. Similar seasons in Europe have names dating back to the Middle Ages, ascribing them to various autumnal saints; usually St. Martin, whose feast comes on November 11. The ancient Greeks had a belief that these calm spells were a gift of the gods for the special benefit of the kingfisher, whose name in Greek is *halcyon*. The kingfisher was supposed to build a floating nest on the sea, and to sing sweetly to its brood; whence the phrase “halcyon days.” Actually of course the kingfisher builds its nest in a burrow

in the stream or lake bank, and is not at all notable for vocal virtuosity. However, that's just some more of cold-blooded modern science's upsetting of pleasant old fancies.

The glistening gossamer threads that float through the air and catch on trees and shrubbery during Indian summer are a source of mystery to many persons. They look just like spiderweb, only you don't see any spiders. Actually they are spiderwebs, and if you look sharp at the right time, you may see the spiders. But as a rule you'll have to get up fairly early, and on just the right days. Very tiny spiders, recently hatched, climb out on the ends of twigs when very gentle air-warmed currents are rising. They spin these thin threads each with a tiny parachute-like tuft at its end. When the lift becomes great enough, away they sail, seeking their fortunes like true Argonaut adventurers. It is the method of migration-dispersal followed by these spider species.

These glistening threads, too, were the source of an old folk-belief. It very likely is older than Christianity; but at present, and for many generations past, peasants in the Catholic parts of Europe call them various names that all translate as "Mary's threads." Because they are so delicate, and perhaps because they have a bluish glint in the autumn sunlight, they are supposed to be ravelings from Our Lady's veil, drifting down like a benediction on a quiet world.—FRANK THONE.

ROUNDING UP ANTELOPES

PRONGHORN antelope, the fastest things that run on four legs on this continent, have been very successfully rounded up by airplane, for transplantation in trucks to new places on the range. In the *Journal of Wildlife Management*, Lee William Fisher, of the Texas Game, Fish and Oyster Commission, tells how, in illustrated detail.

Pronghorn transplantation is desirable, Mr. Fisher explains, because while the fleet little animals get along excellently with cattle on their range, they simply don't "mix" with sheep. So it is the practice so far as possible to remove them from sheep country and release them on cattle lands, where they are welcome.

The first round-ups of pronghorn in Texas were carried out by men on horseback. However, the method proved slow and rather costly. Mr. Fisher had noticed, during airplane flights made for the purpose of counting pronghorn herds, that the animals would run away from the sound of the motor. So he tried some experiments, and soon learned that small pronghorn herds could be bunched into one big herd, and then "drifted" in any desired direction, by flying a plane on the opposite side, at heights between 50 and 500 feet. A small, low-powered, slow-speed plane was found most suitable for the purpose, as well as very economical to operate. The herds are "drifted" into a big wire corral, and driven from that into a smaller pen made of strong cord. From this they are removed and examined, weighed and loaded into trucks for transportation to their new homes.

Since adoption of this method, 467 animals have been trapped and transported, with a loss of only three killed. The whole cost for each animal was only about \$4.30.

ITEMS

TYROTHRICIN, a potent germ-killing substance obtained from bacilli that live in the soil, has been tried with "discouraging" results in sinus disease and infections of the nose and throat of the kind most laymen refer to as colds. Use of the substance in these conditions and its apparent failure in general to benefit the patients was reported by Dr. J. R. Lindsay, of Chicago, at the meeting of the American Academy of Ophthalmology and Otolaryngology. Tyrothricin is the crude substance isolated by Dr. René Dubos, at the Rockefeller Institute, and contains two crystalline substances, gramicidin and tyrocidine. Gramicidin has been hailed as an important new chemical remedy for diseases caused by germs of the gram negative group. Dr. Lindsay's experience with the parent substance, tyrothricin, shows one group of infections for which it is ineffective. Tyrothricin can not be given by injection, because it must be kept out of the blood stream since it separates hemoglobin from the red blood cells. So Dr. Lindsay used it in the nose, throat and sinuses by spraying, swabbing and dropping.

HOPE for doubling the nation's stockpile of morphine through use of a potentiating drug is discouraged by research, reported by Dr. Howard L. Andrews, U. S. Public Health Service, in the *Journal* of the American Medical Association. By giving prostigmine methylsulfate with morphine, it had previously been reported that pain could be relieved with only about half the amount of morphine usually required when given alone. Besides conserving morphine, this potentiating drug might also reduce the risk of morphine addiction developing from morphine given to relieve pain. As a result of studies at the U. S. Public Health Service Hospital at Lexington, Ky., where narcotic drug addicts are treated, Dr. Andrews concludes: "It appears that the combination morphine-prostigmine methylsulfate is not significantly more effective in raising the pain threshold than morphine alone and that the addition of prostigmine methylsulfate does not appreciably change the rate at which tolerance is developed."

PINK-FLESHED trout, and presumably other fish also, contain more vitamin A than white-fleshed trout, according to preliminary experiments made by Dr. C. H. Clausen, of the University of Colorado School of Medicine. His discovery came in studies undertaken at the request of Director C. N. Feast, of the Colorado Game and Fish Department, who wanted to know why flesh of the same sort of fish, such as brook or rainbow trout, may graduate from white to a deep clear pink. The pink flesh contains more vitamin A than the white flesh, and Dr. Clausen also found more vitamin A in the flesh of crustacea, main food of the trout, which lived where the pink-fleshed fish do. Dr. C. E. Hagie, educational manager of the department, points out that foods rich in vitamin A, fed to trout in ponds where they are reared tame for the table, may help pond-owners produce only pink-fleshed fish, which are considered more attractive, as red salmon are considered more attractive than those with paler meat. The experiments are being continued.