

THE SCIENCE NEWS-LETTER

A Weekly Summary of Current Science

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ISSUED BY
SCIENCE SERVICE

1115 Connecticut Avenue
WASHINGTON, D. C.

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SUBSCRIPTION: \$5 A YEAR, POSTPAID

No. 84

Saturday, Nov. 18, 1922

MEASURES FEEBLE HEAT STARS SEND TO EARTH

By measuring a hundred millionth degree of temperature and a trillionth of an ampere of electric current, Dr. C. G. Abbot, of the Smithsonian Institution, has determined for the first time the heat spectrum of starlight with great accuracy.

Working with the 100 inch telescope at Mt. Wilson Observatory this fall, Dr. Abbot measured the heat at different parts of the spectrum of ten stars and the sun. The rays were dispersed by a spectroscope in a band similar to the rainbow.

The bright star Capella, which is very similar to our own sun in its spectrum, was found to furnish the equivalent of one horsepower to an area on the earth approximately equal to the state of Minnesota. But this prominent star is feeble compared with our sun, which is equal to a hundred billion Capellas and sends down on twenty square feet heat equal to a horsepower. On the whole earth Capella's heat equals 500 horsepower, and as all the stars together equal 500 Capellas this would amount to 250,000 horsepower over the whole earth from the stars alone.

Dr. Abbot explained that his work on the heat of stars, accomplished with the cooperation of L. B. Aldrich of his staff, is an outgrowth of the principal work of the Astrophysical Observatory, which is the investigation of the sun.

"This work was begun about 1890 by Dr. S. P. Langley whose great pioneer work in measuring the sun's heat, its distribution in the spectrum, and the losses and modifications which it encounters in passing through the earth's atmosphere, were classic", said Dr. Abbot.

"It might be supposed that the investigation of a heat source whose in-put on the earth's surface amounts to the equivalent of a horsepower per couple of square yards would require only simple and insensitive apparatus, but such is not the case. The complexity of the solar beam, made up of rays of greatly differing wave length which are all differently transmitted by the earth's atmosphere, requires the employment of the spectroscope to separate the rays, and for the recognition of their heat the use of highly sensitive thermometric apparatus.

"The most satisfactory heat instrument for these purposes is the bolometer, invented by Langley about 1880. Two hair-like wires of platinum are placed side by side, the one hidden from the rays by means of a metallic diaphragm, the other exposed in the spectrum. The heat absorbed by the exposed thread, if it be as

little as the millionth of a degree, suffices to disturb a sensitive electrical balance, and by a beautiful device introduced by Langley in the earliest years at the Astrophysical Observatory these indications are automatically recorded from one end of the spectrum to the other. The record takes the shape of a curve which mounts to different heights with reference to its base line, and these heights are proportional to the heat in the various rays of the spectrum. The absorption bands due to the chemical elements in the sun, and those due to some of the elements and compounds of gaseous nature in the earth's atmosphere, are indicated as depressions in this sinuous curve. In this way the effects of the earth's atmosphere upon the sun rays may be determined and allowed for, so that the intensity and quality of the rays as they would be outside the atmosphere, on the moon, for instance, where there is none, can be computed. When this is done, the intensity of the sun's heat freed from atmospheric influences is found to be variable."

The form of distribution of the solar spectrum gives an indication of the temperature of the sun. Just as the blacksmith's iron as he heats it becomes faintly glowing, then a brighter red, then yellowish, then white hot, so the spectra of the sun and other stars depend for the arrangement of the intensities of the different colors upon the temperatures which prevail in these sources of light. The measurements of the Smithsonian Institution indicate a temperature for the sun approximating 6,000 degrees C.

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ALUMINUM SULPHATE MAKES RARE FLOWERS AND FRUIT THRIVE

Magnificent orchids and rhododendrons and gigantic blue-berries can be grown in ordinary soil to which aluminum sulphate is added, Dr. Frederick V. Coville, chief botanist of the U. S. Department of Agriculture, has discovered. Such rare plants will not flourish in untreated soil that is alkaline.

The farmer applies lime to make his soil alkaline and capable of raising bumper yields of the common crops, but the nurseryman can now reverse the process and apply aluminum sulphate to make the soil acid and capable of raising blueberries, orchids, and rhododendrons, if Dr. Coville's experiments are applied on a large scale with continued success.

This treatment gives promise of making easy the cultivation of all plants requiring an acid soil.

Orchids, azaleas, kalmias and other difficult plants, Dr. Coville believes, will be made to thrive in common soils by this means. The discovery is expected to prove of especial value to nurserymen in saving them from the necessity of using peaty lands to raise these flowers.

Rhododendrons grow with great luxuriance in sand mixed with peat, with rotting wood, or with half rotted leaves, but they die in ordinary garden soil because its reaction is neutral or alkaline. Partially rotted leaves are the chief source of soil acidity. And the rhododendron must have an acid soil. The alum or aluminum sulphate when first applied has an acid effect and this acidity is continued owing to the fact that the lime in the soil, which would tend to make it neutral, is

replaced in the soil by aluminum and the released lime is leached away in the form of calcium sulphate.

The growth of the rhododendrons has been stimulated very greatly in this way. In one experiment, Dr. Coville placed three plants in the same sort of soil. One was untreated, another was treated with Epsom salts and one with aluminum sulphate. The untreated one failed to flourish. The Epsom salts treatment caused an increase in diameter of 30 percent, while the increase due to the aluminum sulphate treatment was 250 percent.

Most American crops are natives of alkaline or neutral soils, and for that reason the most prominent problem has been to prevent soil acidity by the addition of lime. This is the first time that an artificial means of converting an alkaline soil to acidity has been worked out.

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NEWS OF THE STARS

Undiscovered Planets May Circle Sun

By Isabel M. Lewis,
of U. S. Naval Observatory

There is no good reason for believing that Neptune is the outermost planet of the solar system and there are a number of excellent reasons for suspecting that one or more planets may be patrolling the outskirts of the solar system far beyond Neptune's orbit.

In the first place the existence of one or more such bodies is possible since the gravitational control of the sun extends to an enormous distance beyond the orbit of Neptune. The sun would not have the slightest difficulty in controlling the motions of a planet ten times more distant than Neptune though it would take five thousand years for such a planet to complete one revolution around the sun.

Not only is the sun powerful enough to control a planet at this distance but there are indications that it may do so. It is a well-known fact that many comets return repeatedly to the sun. The perihelia of such comets, that is their points of nearest approach to the sun, usually lie far within the orbit of Jupiter and frequently well within the orbit of the earth. Their aphelia, however, or the most distant points in their orbits, usually lie near the orbits of the outer planets. The position of Jupiter's orbit, for instance, could be traced out by means of the aphelia of the comets that lie near it. Uranus and Neptune also have these comet families, as they are called. The famous Halley's comet is a member of Neptune's comet family. Now a study of the nature of the orbits of comets that recede to great distances from the sun has shown that there is a tendency for the aphelia of these orbits to cluster at certain definite distances far beyond Neptune's orbit. On the basis of this fact alone some astronomers have predicted the dis-

covery of two or more planets at points far beyond the orbit of Neptune.

In addition it has been noted that Uranus and Neptune are not traveling along as smoothly in their orbits as might be expected.

There are certain small irregularities in their motions, perturbations as they are called, such as would be produced by the gravitational attraction of one or more exterior bodies. Perturbations of the same kind but larger in amount were observed in the motion of Uranus prior to the discovery of Neptune and led eventually to the discovery of the disturbing body, -Neptune.

The difficulties of discovering a trans-Neptunian planet, granted its existence, are very great. In the telescope such a planet would appear simply as a faint star, probably several magnitudes fainter than Neptune. It may be recalled that Neptune was observed several times as a star and its position recorded in star-catalogues, without any suspicion of its planetary nature being entertained, long before it was discovered as a planet. The motion of a trans-Neptunian planet, the only respect in which it would differ from a star in the eyes of the observer, would not be detected readily as it would be extremely slight during the period of observation. It is probable that the discovery of such a planet would be made only from a study and comparison of photographic plates which would show the change in the position of the planet. The asteroids, or minor planets, are easily picked up on photographic plates by the trails they leave during the period of exposure but this is due to the fact that they are rapidly moving objects and are comparatively close to the earth.

MEDICAL MEASURES BEFORE PUBLIC

Whether science shall be allowed to continue its service to humanity to the fullest extent came before the people at the polls at the recent election in three states, California, Colorado and Washington.

In the first two of these states, the people were to decide by popular vote whether medical research involving the use of living animals shall be prohibited. In Washington, an effort was made to repeal an act passed last year which allows parents to forbid examination of their children in school by the health authorities.

The charges of antivivisection propaganda that medical experimentation on animals is inhumane have been vigorously denied by the American College of Surgeons in convention last week at Boston, whose resolutions say:

"Humane rules governing animal experimentation which have been in force for years are observed in the laboratories of all the medical schools and medical research institutes in the United States. As has been published by the Blue Cross, the doors of these laboratories are open to representatives of humane societies and other proper persons. Diseases of animals, which have heretofore caused sickness, suffering and death to millions of animals, have been already in large part conquered, and every year sees further progress in preventing their prevalence. By this means the food supply of a famishing world has been enormously increased. To prohibit such experiments, as is proposed in California and Colorado, would mean cruelty both to man and animals."

ANIMAL EXPERIMENTATION VITAL TO NATION

Animal experimentation is fundamental to the progress of sanitation, modern medicine and physiology, nutrition, the teaching of biology, and the protection of our industries and agriculture, says a joint statement issued by Dr. David P. Barrows, president of the University of California and Dr. Ray Lyman Wilbur, president of Stanford University, which urges the necessity of defeating the initiative measure preventing animal experimentation voted on in California.

"The control of the epidemic diseases of man and of animals, the management of surgical operations and of childbirth and the certification of milk, food and water supplies would be impossible without the knowledge gained by such studies," they say. "In fact, the present day protection of the public from diseases, which is vital to our community life, rests on animal experimentation. The University of California and Stanford University are vitally interested in the defeat of this initiative measure, since its passage would be a statewide calamity."

"Not only would it stop the research work now going on in the medical schools, hospitals and laboratories and in the Bureau of Animal Industry, but it would damage the market for most of California's food products, and markedly reduce the confidence of visitors coming into the state. If California could not certify to its food and water supplies, could not guarantee protection against contagious diseases, could not provide certified milk, the effect on agriculture and industry in the state would be disastrous. The near collapse of the olive industry, due to the poisoning of a few people in eastern states, and the way in which the industry was saved by the researches carried on in the laboratories of the two universities, indicate the imperative necessity of freedom for the universities in animal experimentation. California food, instead of being looked upon as an example of purity, would be shunned.

"The initiative measure would make it impossible to test with birds for deadly gases in the mines of the state. It would stop the manufacture of serum for the prevention of hog cholera, the preparation of vaccine for anthrax, and the various other products that are required for the protection of our industries in agriculture and that annually save millions of dollars and prevent great mortality among domestic animals. Under the act, operations on various farm animals could be carried on without anesthetics to increase the palatability of foods, but no animals could be used in experimental work if the information obtained is for the benefit of a person or of the human race.

"We feel that no worse attack on the welfare of the state and on the right of the universities to seek and teach the truth could be made. Every man, woman and child, every unborn babe, every domestic animal in the state would be affected if this measure becomes a law. It strikes at all. It is unnecessary special legislation, due to prejudice and misinformation. No one will tolerate cruelty to animals. The present laws of the state are drastic and sufficient to control any abuse. We know that there is no cruelty to animals in the laboratories of the universities. They are in charge of men and women of the highest character who are unselfishly working to better the lot of their fellow men and to advance the interests of their community and of the state. Anesthetics are always used for animals in the laboratory in exactly the same way that they are used by surgeons in the operating rooms."

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(A Chat on Science)

SCIENCE GIVES BEFORE SHE IS ASKED

By Dr. Edwin E. Slosson

What is commonly called "applied science" is often nothing of the sort. It may be uncomprehended discovery of some unscientific inventor, unknown workman or untutored savage. Years after it has been in use comes the scientist who discloses the reason of it and claims it as an application of his new principle. But times are changing and now the scientist leads the technologist in the lead in many lines.

The compass has been known for some forty-five hundred years before Faraday showed the relation between electricity and magnetism in 1821. This is not merely explained the mystery of the magnetic needle, but it led to the dynamo and all its innumerable applications. The chemist cannot claim vegetable indigo since its use dates from undated times. But he can claim synthetic indigo and all the host of dyes that came from aniline. The wild wheat of Palestine was the gift of nature. The rustless wheat of Manitoba is the creation of the plant breeder.

I am dwelling upon these familiar facts because it does not seem to me to be sufficiently realized that we are entering upon a new era when science shall devise and direct and not merely interpret. This is the era which Francis Bacon foretold three hundred years ago when he said in *De Dignitate et Augmentis Scientiarum*:

"As a man may proceed on his path in three ways: he may grope his way for himself in the dark; he may be led by the hand of another, without himself seeing anything; or lastly, he may get a light and so direct his steps; in like manner when a man tries all kinds of experiments without order or method, this is but groping in the dark, but when he gets some direction and order in experimenting, it is as if he were led by the hand, and this is what I mean by Learned Experience. For the light itself, which was the third way, is to be sought from the Interpretation of Nature, or the Organon."

We have now passed, in several of the sciences, from groping in the dark or being led step by step, to the Era of Enlightenment where we can survey the whole field in front of us and choose the straightest path to our goal.

Nowadays discoveries do not always "fill a long felt want" to use the familiar phrase. The want has often to be created after the discovery is made, usually with the aid of the advertiser. The unimaginative masses do not ask for comforts and conveniences that they have never known or dreamed of. It was no great popular demand that created the phonograph and the motion picture yet nothing is more popular.

Formerly a manufacturer who felt the need of some new material, say a dyestuff or a dielectric, was forced to survey the world from China to Peru in search of it. Now he sits in his office and has offered to him all sorts of new substances in the hope that he will grant them the favor of a tryout. A physician may have more new remedies sent to him as samples than he has patients to use them on. This is the way it should be, for with science in the lead mankind will make more rapid progress.

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EXPEDITION STUDYING SOUTH SEA BIRDS

About 3,300 species of birds, including some heretofore believed extinct and some hitherto unknown to science have been secured by the Whitney South Sea Expedition of the American Museum of Natural History, according to Dr. Robert Cushman Murphy. Dr. Murphy is associated with Drs. Leonard C. Sanford and Frank M. Chapman in the administration of this expedition, which, through a contribution of \$100,000.00 by Harry Payne Whitney, is the most elaborate expedition ever equipped primarily for bird study.

Much light has been thrown on the geographical distribution of many sea birds, as well as many insular land flyers. The collections show that birds of the tropical tradewind belt in the South Pacific are for the most part of a different race from those inhabiting the latitudes of calm farther south.

It has also been discovered that in some cases every inlet within a single group of islands has a well-marked geographic race. The range of some of these is no more than a few acres.

Although the expedition is primarily out to study birds, it is losing no opportunity to obtain material valuable to other branches of science. In some of the Polynesian islands the native people and animals are dying out or changing with changing conditions. Information in regard to these is being collected in cooperation with other scientific organizations.

In order to avoid duplication of work, it has been decided to leave the bird investigations in the Hawaiian Islands and certain neighboring groups, such as Midway, Johnston, Palmyra and Washington Islands to the Bishop Museum of Honolulu.

The expedition is equipped with the most complete compilation of data known covering the notes on extinct, doubtful, and mythical species of animals described by the early sailors of the South Pacific.

The collecting work of this expedition has hardly begun, but already many birds and bird stomachs preserved in alcohol have been received. The contents of all of these stomachs will be analyzed and reported on by the United States Department of Agriculture.

Photographs are being taken not only of the birds and wild animals of the places visited, but interesting features of the life and appearance of the people and the islands are being captured at points where civilization has touched but little.

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BIRDS LAY LIVES ON ALTAR OF SCIENCE

Are birds sharing the popular interest in science? Dr. Frank M. Chapman of the American Museum of Natural History tells a recent instance in which strange species of petrels voluntarily joined an expedition in search of them and so aided the scientists when it seemed impossible for the naturalists to help themselves.

Dr. Chapman and his exploring party were returning to Panama from Guayaquil by steamer. Throughout the day, the expedition was followed by a large number of petrels, some of which it was impossible to identify from the deck of the boat, while others were recognized as exceedingly rare species which had heretofore not been recorded from that part of the Pacific.

It was impossible to secure specimens of the birds from the steamer. Shortly after nightfall, however, the birds flew aboard. Specimens of all the species observed during the day were secured with one more added. Apparently the birds were attracted by the lights of the boat.

READING REFERENCE - Thomas, J. Arthur. Haunts of life. p. 83-7. N. Y. Harcourt, Brace & Co. 1922. Berridge, Walter S. Marvels of the animal world. Boston, Small, Maynard & Co. 1922.

LEAGUE REVEALS DETAILS OF PLAGUE IN UKRAINE

Geneva.--

More than 1,300 bodies waiting burial, hospitals swamped with cholera victims, hundreds helpless in the homes, vermin swarming unchecked for lack of fuel and water, with inoculation rendered ineffective for want of food, are among the details of the epidemic of cholera now subsiding in the Ukraine as revealed by a report of the Health Section of the League of Nations published here.

At Odessa prophylactic inoculation was resorted to only after hundreds of cholera cases had been reported. The ten sanitary officers available found themselves unable to visit and isolate all the cases. Hospital accommodations were never adequate. There was but one auto truck available to remove the dead. Labor was hard to get to move the plague stricken dead. Bodies were pitched into a common pit and chloride of lime thrown on top of them. Lack of water and fuel made delousing and bathing practically impossible. Similar conditions were found at Kherson, once the chief town of the government, the streets of which are now all but deserted. Experience in this epidemic has also demonstrated that protection against cholera by vaccination varies according to the state of nutrition of the vaccinated population.

COLD WINTER COMING IS BEST WEATHER BET

The coming winter will probably be a cold one, despite the heralded reports from Norway telling of warm weather in the Arctics.

Maj. E. H. Bowie, forecaster of the U. S. Weather Bureau, says that daily observations received by radio from Spitzbergen, Iceland, and Wrangel Island, as well as from the Amundsen Polar Expedition north of Alaska indicate temperature conditions contrary to those reported as prevailing in the eastern Arctic by Consul Ifft at Bergen, Norway.

The abnormally warm weather said to have been found in the eastern Arctic is not confirmed by the records received from stations in other sections of the Circle. Recently there was a big snow storm on Spitzbergen, and from Wrangel Island, beyond Bering Straits, reports of exceedingly low temperatures have been made since August.

About the coming winter, Maj. Bowie says that although meteorologists do not make definite long distance weather forecasts, the chances are that the approaching winter will be cold. The last two winters have been abnormally warm, and according to the law of probability it is unlikely that this winter will follow suit.

Whatever effect may have been produced by the possible greater speed of the equatorial currents carrying warm waters higher in the Arctic, as claimed from Norway, this is not likely to modify the winter in the Northern Hemisphere in general. U. S. Hydrographic officials here say they have received no reports tending to confirm this greater warmth of ocean current water and no unusual ice or water conditions have been found this season.

PRELIMINARY TRANS-ATLANTIC RADIO AMATEUR TESTS SUCCESSFUL

Messages broadcasted by amateur radio stations in preliminary trans-Atlantic tests just completed were received across the water in England, reports from that country say.

For ten days on predetermined schedules, amateur radio enthusiasts in all parts of Canada and the United States competed in order to qualify for a special place in the final trans-Atlantic tests that will be held between December 12 and 31. To qualify they had to be heard by a station at least 1200 air miles away. Indications are that many will compete in the final tests.

The way in which the amateurs in the different radio districts kept within their allotted times was gratifying, according to officials of the American Radio Relay League who are managing the tests.

At least 20,000 radio amateurs are competing in these tests, it is estimated.

Taxicabs in Havana use gasoline in preference to the much cheaper alcohol, because congested traffic conditions require quick starting ability.

Airplanes are carrying mail in Morocco over a route formerly covered only by means of camels and donkeys.

TABLOID BOOK REVIEWS

THE BOOK OF RADIO. By Charles William Taussig, Published by D. Appleton and Company, 1922, New York City. 447 pp. \$3.50.

Written not alone for the amateur but also for the professional. Gives a particularly clear and accurate conception of radio from the very beginnings up to the present time. It is entirely practical in the treatment and operation of radio apparatus. An interesting feature is the discussion of every day uses for radio and what is being done by the Government.

THE REIGN OF RUBBER. By William C. Greer, vice-president, B. F. Goodrich Company. The Century Company, New York. \$3.00.

A story of the part rubber plays in the activities of mankind written in ordinary language by a rubber expert. It traces the evolution of rubbers from the ball playing of the pre-Columbian Indians to the gigantic truck tires of today. The reader is taken to foreign lands to gather the raw rubber and the many other ingredients that make erasers, fire hose and rubber shoes.

APPLY SPELLING BEE TO CHEMICAL NAMES

Scientists are bringing the old-fashioned spelling bee up-to-date. Dr. C. A. Jacobson has announced that the Chemistry Department of the University of West Virginia will repeat this year the highly successful chemical formula contest staged by the students in inorganic chemistry last May.

According to this revised version of the old spelling match, the names of chemical compounds are announced by the professor and the contestants try to spell down their opponents in giving the correct formulae. The professor announces "sodium chloride" or common salt and the student must reply "NaCl". "Formaldehyde" must bring forth the response "HCOH". It is believed that if the formulae of "tetramethyldiaminodiphenylmethane" were demanded it might prove a stumbling block. This spelling bee idea may be adopted in other branches of science besides chemistry.

READING REFERENCE - Barrows, Frank E. Investigations of the chemical literature. Reprinted from Chemical and Metall. Engineer 24 nos. 10-12 March, 9.16 and 23, 1921. Fabre, Jean Henri. The wonder book of chemistry. N.Y. Century Co., 1922.

There are 525 known uses for the white, odorless, tasteless, light bass wood, the largest quantities of which have been furnished by Wisconsin and Michigan in the last twenty years.

It would take 1,340,000 barrels of powder to give a bullet the speed with which an electron travels.

Noiseless rubber composition paving blocks estimated to wear fifteen years and made at a price to compete with ordinary creosoted wooden blocks have been invented in England.
