THE SCIENCE NEWS-LETTER

A Weekly Summary of Current Science

EDITED BY WATSON DAVIS

ISSUED BY
SCIENCE SERVICE
1115 Connecticut Avenue
WASHINGTON, D. C.

EDWIN E. SLOSSON, Director
WATSON DAVIS, Managing Editor

SUBSCRIPTION: $5 A YEAR, POSTPAID

Vol. IV, No. 151 Saturday, March 1, 1924.

IS THE MOON AS DEAD AS IT LOOKS?

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

Though nine out of ten astronomers will say, if you ask them, that the moon is a world that is absolutely dead and lifeless - "burnt out slag" is the favorite expression, the tenth astronomer who is also apt to be the man who has devoted years of his life to the study of the lunar topography will tell you that some strange things are going on up there and that the moon may not be as dead as it seems to be.

Prof. W. H. Pickering who has been observing the moon, as well as Mars, pretty steadily for years under remarkably fine observing conditions at the station of the Harvard College Observatory at Jamaica writes in a series of articles for Popular Astronomy of changes that he has been observing recently in the lunar crater Eratosthenes.

This crater is about 37 miles in diameter and terminates that magnificent chain of lunar mountains known as the Apennines. Its floor, from which rise three lofty central peaks, lies about eight thousand feet below the surrounding surface of the moon and on its finely terraced walls are individual peaks that reach heights of about 15,000 feet.

The region to which Prof. Pickering has devoted particular attention has an area of about 1,000 square miles, which is about one-third the area of the Yellowstone National Park. It lies along the inner slopes of the encircling walls of the crater. Here, even at lunar midday, when, as is well known, shadows are a geometrical impossibility, Prof. Pickering has observed shifting dark streaks and dark grey fields that change continually in form and position and in intensity, now fading out, now darkening and spreading over the surface. They appear on elevations as well as in depressions in this region, but in no way resemble the sharply defined lunar shadows which we have all seen either on photographs of the moon or by direct observation with the telescope. The appearance of these dark streaks and patches changing in position, form, and intensity with the elevation of the sun above the lunar horizon, Prof. Pickering attributes to the growth and decay of what, for want of a better word, he styles "vegetation", though recognizing the impossibility of the existence of terrestrial forms of vegetation on the moon.

This idea that changes are taking place on the moon is by no means new, either with Prof. Pickering, who has been recording changes on the moon for years in this and other craters, or with other astronomers who have devoted much time to the study of the moon. In a treatise on the moon published not so many years ago, the English astronomer Elger protested vigorously against the continual reiteration in practically all text-books on astronomy of the idea that the moon is a world where no change ever occurs.

Among the changes that have been recorded by a number of lunar observers are the darkening of the floor of the lunar crater Plato and of some of the "seas" at each lunation. These so-called seas are the extensive dark regions that lie at a much lower elevation than the brilliantly lighted portions. They are the dark spots on the moon that are so plainly visible to the naked eye. Other changes consist of the continual appearance and disappearance of nimbus or fog above small craterlets that resemble strongly volcanic vents on the earth. There appears to be good reason to believe that volcanic activity has not completely ceased on the moon, though it is now confined to the comparatively mild form of eruptions from small crater-cones. Then, in addition, to such changes, Prof. Pickering and some other astronomers of today record snow fields that shift and change in position with the sun. It is Prof. Pickering's belief that life on the moon, whatever form it takes, is confined to certain regions, which he uses the word "oases" in describing, that are separated from one another by extensive desert tracts.

Whatever we may think of life on the moon it is a fact that we rather neglect this small world which we claim as our own offspring. Astronomers like to show it off in the telescope on visitor's night to the observatory but they are pretty apt to forget all about it for the remainder of the week.

NEW AIRPLANE CAMERA TO MAKE FUTURE MAPS

The surveyor by taking to the air will be able to make more accurate contour maps with greater speed than now possible, Prof. H. L. Cooke of Princeton University indicated in an address before the Franklin Institute in which he announced the development of a new method of taking and interpreting airplane photographs for map making.

Wide-angle lenses that photograph ten square miles of territory from 10,000 feet in the air, a new method of making time exposures from speeding airplanes, a new optical method of locating the airplane in space, and stereoscopic projection of the photographs contribute to Prof. Cooke's improved method of surveying.

"A rapid and accurate method of producing contoured maps from airplane photographs is urgently required in practically all the civilized countries of the world", Prof. Cooke explained. "In this country there are still about two million square miles which have not been covered by contour maps, and the need of maps is felt daily by large industrial interests. At the present rate of progress it will require more than forty years to complete this work, but now that the problem of airplane surveying has been solved it is certain that

within a quarter of a century this country will be completely mapped.

"Photographs made from airplanes by present methods are not sufficiently accurate for use in the making of government maps. In the near future it will be possible to run aerial traverses between geodetic control points at intervals of twenty to thirty miles and thereby eliminate the enormous cost of secondary and tertiary triangulation."

Some ground surveying will still be necessary with the new method, and detailed information not given by the photographs will be obtained by surveyors travelling around in small cars with enlarged prints of airplane photographs on which missing information will be sketched to be forwarded to the drafting room.

The accurate determination of the position of the airplane in space is effected by the projection of the photograph upon a glass screen upon which three known points of the landscape pictured are placed in correct relative position. If the relative position of the photographic plate and the projection lens is the same as when the picture was taken and if the fixed points on the screen and in the picture be made to coincide, the distances from the lens to the fixed points on the glass screen bear exact relations to the distances of the fixed points in the landscape which was photographed, and what is more important, to the height of the airplane above the ground when the picture was taken.

With the height of the airplane known, cross-bearings may be taken of all points of the landscape, and by means of stereoscopic projection, the landscape may be shown in relief, and contour lines quickly mapped.

Professor Cooke attached great importance to the production of a camera capable of taking wide-angle pictures of relatively long exposure while moving at high speed. He has been at work for several years on the production of such an instrument, and said it was now possible to take photographs showing sharp definition while travelling 90 miles an hour and using an exposure of one second. The effect of the vibration of the airplane and the drift of the landscape are compensated for by suitable devices.

WATER CURTAINS

It takes more heat to warm up water than any other common substance. That is one reason why water is so handy in putting out fires. It is also making cars electric current by burning coal under a boiler. Every new installation requires careful study of local conditions to determine the relative costs. But in the case of Muscle Shoals water power plant there is no doubt that whoever leases the property will be securing power about as cheap as it is possible to make it anywhere on the American continent.

Standards for whiskey and brandy as medicines will be included in the new Pharmacopoeia now being revised.

WATER POWER NOT ALWAYS CHEAPER THAN COAL

By R. S. McBride,
Engineer - Chemist

The power being developed by the Government at Muscle Shoals promises to be among the cheapest of great water power developments in the United States. There is no wonder, therefore, that the Government is receiving several important offers for the privilege of leasing this power development. Several power companies of the Southeastern states have associated themselves together for one offer; Mr. Ford nearly two years ago made another offer; and lately a third proposal has come from electro-chemical interests who desire to operate the property for the Government. Many political as well as economic factors affect the consideration of these proposals. But the engineering facts which determine the probable cost of Muscle Shoals power are not subject to dispute.

The power generated from a waterfall costs more or less according to the investment required for dam, power house, and electric equipment. The cost of operation of any such hydro-electric power station is small, so that the cost to the user of current is almost altogether dependent upon the cost of building the plant, for example, whether it requires $150, $200, or $250 per kilowatt of installed power capacity. At Muscle Shoals the power promises to be very cheap because the investment cost there is relatively low and the quantity of power which will be developed is very great, amounting at the maximum capacity of the power station now under construction to 250,000 horsepower.

It is very important to compare such big water power plants with installations of similar capacity which might generate power from steam made by burning coal. The initial investment required for such steam electric station would be relatively much less but the cost of operating would be several times greater than in the hydro-electric station, just how much greater being determined principally by the cost of coal.

If coal costs $4 per ton at the steam power station, and a hydro-electric plant could be built for $150 per kilowatt of capacity, about $112 per horsepower, then there would be little choice between the two. In other words, with low investment for hydro-electric station and low fuel cost for steamelectric, it makes little difference to the power user which way his current is generated. But let the cost of labor and of concrete for building the dam increase by 33 per cent so that the installation would cost $200 per kilowatt of capacity installed and then the steam electric station could afford to pay $6 for its coal supply or perhaps even more than that.

In any case the cost of recovering the energy from the waterfalls to light our cities and to run the motors of industry may be greater than the cost of making this electric current by burning coal under a boiler. Every new installation requires careful study of local conditions to determine the relative costs. But in the case of Muscle Shoals water power plant there is no doubt that whoever leases the property will be securing power about as cheap as it is possible to make it anywhere on the American continent.

Standards for whiskey and brandy as medicines will be included in the new Pharmacopoeia now being revised.

SIMPLE SCIENCE

By WOW

(WOW is a Professor of chemistry in a large University)

LIGHT

There's twenty three different kinds of lights - sunlight, moonlight, stars, lamps, matches, fireflies, etc. We have the first six in the country. The country's all right any time of the year, except nights. When you go to bed starlight nights, you don't know whether you put out the lamp or not. You can always tell on moonlight nights because it's brighter. We use four lamps to read with, three to eat supper with, two to sit around the stove with, and one to go to bed with. Town's the place for light. We go there three times a year - Uncle Tom's Cabin night, circus day, and the Fall fair. We live a long ways from town - about thirteen miles in the day-time, and twenty-six at night.

Sunlight's very funny. It's what we call white light. It's white because it's made up of seven colors - red, orange, yellow, green, blue, indigo and violet. I never believed this 'till I saw the colors going round on a wheel at the circus, and I declare they all changed to white. I suppose the sun mixes them all up, and then we just see the white light. They say the sun's ninety million miles away. It's hard to believe one can see so far without a telescope.

Moonlight's much softer, and starlight's softer still, but I think lamps are the softest of all, except lanterns. When I take the lantern down to the chicken house at night to close the door, the rooster always crows, because he thinks it's just getting daylight, so it must be very soft.

Acetylene's a terrible bright light, so's electric. I think acetylene's the lightest - I mean the brightest - of the two. That's because it contains so much charcoal - I mean carbon. This gets very hot from the flame, and gives out light, just like lime-light does, only no one uses lime-light now.

The latest thing in light is electric. There's three kinds of electric lights - filament, arc, and vapor, depending on what they're used for, only the filament and vapor don't sputter. The filament is put in a glass bulb filled with nothing, or else nitrogen, or argon. It gives light because the current heats it up, so it's about the same as acetylene and lime-light, only there's no current in them. The arc light's a terrible light too, but not so bad if you use green goggles. It's about the same, only there's no bulb, and a spark jumps across and heats up the carbons. The vapor light's a little different.

Men who make a study of light and such things say it travels to our eyes through the ether, just as though we couldn't see the light, without having it do any travelling. They say what we see isn't light, but it's just vibrations in the ether, or something else hitting our eyes. That is, when we get hit in the eye by these things, we see light. There may be some truth in this, because when we get a good hard bump anywhere on the head we see light. I don't think we know everything about light yet, so we better wait awhile. There'll be a lot more to say about light later on. Next time Nitrogen.

CHEMICAL MESSENGERS

By Dr. Edwin E. Slosson,
Director, Science Service.

What system of government prevails in this body of ours? Is it an autocracy, the one-man rule, such as prevailed in the primitive state and still survives in the army? Or is it a democracy, the equal power of all in politics, regardless of their qualifications, such as is now regarded as the ideal? Or is it an oligarchy where the superior cells and organs manage the inferior?

Strange to say, no system of human government has yet been devised that approaches the organization of the animal organism in character - or in success. The millions of cells, the hundreds of muscles, the dozens of organs, with their infinitely varied powers and functions, are kept in harmonious activity for the good of the whole by some secret system of mutual cooperation which man has not yet learned how to apply to his artificial organism, the state.

The conscious ego cannot claim to be the dictator of the physiological realm which he calls his body. He is not even a Premier, but merely a Foreign Minister. He has a certain control over imports and exports, but the department of the interior is mostly beyond his jurisdiction. It is his business to keep the body out of fights with others that might result in a stab in the heart or a punch in the stomach, but he is not entrusted with such essential functions as keeping the heart pumping and the stomach digesting. For, important as the mind may think itself, it sleeps at its post for a third of the twenty-four hours and is liable to occasional fits of forgetfulness at any time. It is not the brain that mobilizes the white blood corpuscles whenever an army of microbes invades the body through a breach in the outer wall. Sight is not sharp enough to see a microbe and even if the brain suspected an invasion it would not know how to conscript the corpuscles and dispatch them to the front.

All these millions of living cells in brain or brawn or bone have to be kept supplied with food, water, and air in amount depending on how they are working and how fast they are growing. The temperature of every part of the body has to be kept constant no matter whether the weather is cold or warm, and the ashes must not be allowed to accumulate in any cell.

Now one would think that such a marvellously complicated coordination of interdependent activities would require a strict system of bureaucratic centralized government. But on the contrary, the central government, if there is such, has little or nothing to say about most of the physiological processes. The orders to an organ come from below rather than above. For instance, if an overworked muscle needs more oxygen, it does not petition headquarters, but sends orders direct to the heart and lungs to speed up the pumping. If a gang of structural bone workers want more lime or phosphate they do not bother the boss about it but dispatch a message straight to the supply department to import some.

How these multifarious messages could be carried was long a mystery but is now being solved. There are two ways of intercommunication in the body just as there are in the outside world, telegraph and mail. In a telegraphed

message nothing travels except the electrical impulse, but in the postal service a material message, the letter, is transmitted. Inside the body signals may be sent by the nerves, which play the part of telegraph wires, but it has recently been discovered that there is another and more general system of intercommunication by means of chemical substances sent around through the blood, like letters. Professor E. H. Starling of London pointed out the importance of these eighteen years ago and named them "hormones", which is Greek for "messengers", and since then many of them have been discovered and some of them manufactured.

The two systems of transmitting orders supplement each other like telegraph and mail. For instance, a man sits down at a dinner table. The eye signals by way of the nerves, "I see food", and a minute later comes confirmation from the nose "I smell it". At once the saliva begins to pour into the mouth and the gastric juice into the stomach to prepare for the first stages of digestion.

Sometime later when the stomach has finished its work three other digestive fluids have to be in readiness. These are secreted by three separate organs, the pancreas, the liver, and the intestinal glands, and all these have to be notified to get busy as soon as the first food passes out of the stomach.

In this case the message is conveyed by a hormone called "secretin" which within two minutes after it has been sent into the blood stream sets the three organs to preparing their particular digestive juices.

If we get angry or scared, the body has to be put into a state of preparedness for fight or flight, whichever the high authority decides upon. But either will require an extra supply of energy, so the suprarenal glands, without waiting for special orders from headquarters, send a chemical messenger to the heart to pump harder and to the liver to release more sugar into the blood so that no muscle shall be short of fuel in this emergency.

How the sugar is handled depends on another hormone known as "insulin" which has lately been prepared in a form that may be used by diabetics whose pancreas does not work well.

Still more recently comes the announcement of the extraction of a pure and extremely powerful form of "pituitrin", the secretion of the insignificant pituitary body, that controls the kidneys and capillaries.

The chemist is now able to make "thyroxin", which is secreted by the thyroid gland, and a minute daily dose of this may, as Dr. Starling says, effect "the conversion of a stunted, pot-bellied, slavering cretin into a pretty, attractive child."

It is these chemical messengers which in infinitesimal amounts determine whether we shall be tall or short, dark or fair, handsome or ugly, active or sluggish, alert or stupid, cheerful or melancholy, and it is the aim of the chemist to learn how to make them, or perhaps similar substances of even greater potency so that he can acquire absolute control over the workings of the human body.

INDIANS MURDER DOCTORS WHEN PRESCRIPTIONS FAIL

Jibaro Indians, one of the most numerous and important of the aboriginal tribes of South America, kill unsuccessful "doctors". This is the custom revealed in a bulletin issued here by the U. S. Bureau of American Ethnology under the significant title of "Blood Revenge, War, and Victory Feasts". It gives a scientific account of savages in Ecuador more bloodthirsty than any that ever trod the pages of a five-cent novel.

"Since supposed sorcery is nearly always the nearest cause of murders within the tribe", says the bulletin, "it is clear that the professional sorcerers or medicine men are those members of Jibaro society which are most frequently exposed to the revengeful attacks of their enemies.

"When a medicine man has undertaken to cure a sick person, and the latter dies in spite of the treatment, the 'doctor' is also generally made responsible for the death, the relatives of the dead reasoning that the medicine man, instead of curing the patient, on the contrary used his art to kill him. The unsuccessful curer is therefore murdered unless he escapes by flight.

"Since the Jibaros, on the whole, do not recognize what we call natural death, but always attribute a death to supernatural causes, any death among them tends to give rise to a murder, the relatives of the deceased considering it as their duty to take revenge upon the supposed author of the accident."

When the Jibaro kills his enemy, he desires to inflict as large wounds and to shed as much blood as possible. When fighting another tribe, the Jibaro warriors cut off the heads of fallen enemies, remove the skin and hair from the skull, and after an elaborate process which shrinks the features, wear the gruesome trophy suspended from a cord around the neck as a sort of distinguished service medal.

WEED OWNERSHIP PENALTY THREE MONTHS IN JAIL

To own a marihuana bush in California means risking a penalty of three months or more in jail. The local city narcotic squad recently discovered a specimen of this forbidden plant, 16 feet high, cleverly set out on the boundary line between two lots occupied by the interested Mexican culprits. The bush has been confiscated, but the court was compelled to say "not guilty", as nobody could prove which Mexican family owned it.

Under national prohibition California peace officers face a mounting problem in the control of this drug-plant, mainly among Mexicans and negroes.

Marihuana is the Spanish-American name for "hasheesh", or Indian hemp, (cannabis sativa). The plant grows as freely as any weed. Its smaller leaves and seeds are dried, crushed and made up into cigarettes. The cost of production is much less than that of common tobacco cigarettes, but the retail price in the underworld is as much as ten to fifteen cents per cigarette.

The narcotic principle of marihuana, which seems to be chemically unidentified, first exhilarates the smoker and then completely overturns moral self-

control. With the Mexican peon the outcome is likely to be murder in its bloodiest form, or in any event some unnatural and revolting crime.

Some time ago the warden of one of the California penitentiaries was puzzled to find a group of his charges "all lit up" in a narcotic jag, in spite of prison restrictions. It was not until a Spanish-American observed the flourishing hemp bushes in the prison grounds that the secret was revealed. Since then the western officers of the law have become clever in the recognition of the commonplacelooking shrub, whether it be in home gardens or waste-places.

READING REFERENCE - Fuller, Henry C. The Story of Drugs. New York, The Century Company, 1922.

BOTULISM MAY BE EASILY PREVENTED

Fatalities from botulinus poisoning resulting from eating home-canned foods, such as recently occurred in a Pacific coast state, may be prevented beyond reasonable doubt by two simple precautions, officials of the Public Health Service say. These precautions are, first, the rejection of all canned goods which on opening look or smell spoiled or tainted in the least degree; and second, the reheating to the boiling point of all canned goods before serving.

It is not safe to test doubtful cans by tasting their contents before heating, as fatal cases of poisoning have occurred from this practice. The heating should be thorough, all parts of the contents of the can being brought to the boiling point. Unless one wants to risk the lives of the fowls, apparently spoiled goods should not be fed to the chickens, since there are many cases on record where whole flocks have been killed in this way.

While, according to the Public Health Service, botulinus poisoning is a rare disease in proportion to the millions of cans of food packed, it is highly dangerous to eat any such food which appears to be in the slightest degree spoiled. Botulism is very rare east of the Pacific coast states in which outbreaks are much more frequent, the bacteria being apparently more common in the soil of that region. Acid vegetables and fruits which are thoroughly cooked before canning are safest. The greater number of fatalities have occurred from eating canned string beans, spinach, or corn; and more deaths have resulted from eating home canned products than those which are commercially packed.

TREE STUMP IS CHAMPION SPROUTER

Now we have the champion sprouting stump. F. W. Haasis of the Appalachian Forest Experiment Station has sent to the U.S. Forest Service here the record of a 21 inch yellow poplar stump with 218 living sprouts, all of them produced during the last growing season. The tallest of the shoots was fifty-six inches. Challenges are invited.

THE HISTORY OF SCIENCE SOCIETY

The organization of the History of Science Society has been announced by an organizing committee for which David Eugene Smith, 525 West 120th St., New York City, is acting as corresponding secretary. The purpose of the new organization is to encourage the study of the history of science and to insure the permanency and the adequate financial support of the international publication, Isis, edited by Dr. George Sarton.

"The proposed Society will be the first, on any large scale, to afford a common meeting ground for scientists, historians, and philosophers", the announcement says. "Indeed the study of the history of science seems to provide the only feasible method for bridging the widening gap between the men of science on the one hand and the men of letters on the other."

PELLAGRA PREVENTED BY FRESH MEAT DIET

Pellagra may soon be an almost unknown disease. Surgeons Joseph Goldberger and W. F. Tanner of the U. S. Public Health Service in a report on the treatment and prevention of this disease, which while known all over the country has been especially prevalent in the South, state that fresh meat and fresh milk contain the essential preventive factors. A diet containing a quarter of a pound of lean beef, or a quart of milk a day will suffice as a preventive in all but very exceptional instances.

The milk may be taken either as sweet milk or as buttermilk, the preventive factors occurring in the protein of the milk. The butter fat, which is separated when the cream is removed, is without preventive power.

Eight victims of pellagra were treated by feeding them beef, and improvement followed in every case. The doctors emphasize that this is almost certainly not the only way in which immunity may be achieved, but they merely state that such a diet as has been described will prevent the disease. It even seems probable in their opinion that a much less amount of meat or milk will suffice, as an instance of which they cite the relative immunity of oriental races to pellagra in spite of a diet in which meat or milk forms a very small part. Other foods are apparently equally efficient preventives, they state, but what these foods are is not as yet known.

But enough is now known, according to this report, to prevent the occurrence of the disease, to cure cases of at least moderate severity, and to establish that the primary cause of this serious and frequently fatal ailment is a faulty mixture of protein in the diet, or a deficiency in some dietary complex, possibly a vitamin, rather than a germ infection or excessive consumption of starchy foods.

A carpenter in developing his mining claim near Cobalt, Canada, recently uncovered a lump of native silver weighing 3200 pounds and valued at $20,000.
