THE SCIENCE NEWS-LETTER

A Weekly Summary of Current Science

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THE USE AND MISUSE OF EDUCATION

By Dr. Edwin E. Slosson.

Learning is a tool. Its value depends on what is done with it. Give a jack-knife to a boy and he may whittle wood or cut his fingers with it. The knife is neutral. Much of elementary education must be merely formal, the giving of tools to children. The three R's are nothing in themselves. They are merely the keys to the knowledge of good and evil. Whether they prove beneficial or injurious to the student depends on what use he makes of them. Reading the wrong books may make a man worse than an ignoramus. Learning writing may qualify him for forgery and learning arithmetic for swindling. The value of a ship's load cannot be calculated by the inspection of the Plimsoll mark. The value of an education depends more on the character of the cargo than on the capacity of the cranium that carries it. Neither an information test nor an intelligence test can determine what the man's mind will be worth to the world.

In repeating these hackneyed observations I am not presenting an argument against the alphabet, but I am pleading for its proper employment. Illiteracy is always a bad thing, but literacy may be an evil thing.

Opportunity does not insure progress. Christian missionaries like Livingstone rejoiced over the opening up of Africa by commerce and communications because they naturally and naively assumed that it meant the spread of Christianity. On the contrary, it led to an unprecedented spread of Mohammedanism, their most formidable foe.

If science teachers merely teach their students to use the appliances of science and fail to train them in the scientific way of thinking they may find the intellectual aims of science defeated by the machinery of science. The printing press contributes to the spread of superstition and obscurantism as well as to the spread of science. The newspapers publish a lesson in astrology more often than a lesson in astronomy. In our books and magazines fiction vastly outweighs fact. By means of the radio Voliva's argument for a flat earth is broadcasted from Zion City all round the world.

The main object of education in a democracy is not to teach the students how to vote right, but to train them how to think right. Under any form of

government, in an autocracy no less than in a democracy, the real power lies in the people, and it is their individual everyday conduct, guided by their personal beliefs, that determines whether the nation shall advance, stagnate or retrograde.

Politics is not yet a science and there are many ways of reaching the same result. In science there is only one truth but an infinitude of falsehoods. A problem has a single solution. An unwise popular vote on a political question may bring a temporary calamity upon a nation, but an unsound popular opinion on a scientific question may bring permanent ruin to a race. It would not have mattered much if the legislature of Indiana had passed the bill fixing a fictitious value of Pi, but it would have made lots of trouble if the engineers and mathematicians of the world had adopted the wrong figure. The fate of the nation depends less on how the people cast their ballots than on how they combine their chromosomes.

NEW ALLOY QUADRUPLES SPEED OF CABLE

Permalloy, the nickel-iron alloy invented last year in the laboratories of the Western Electric Company, is to be used in the construction of the new cable to be laid by the Western Union Telegraph Company from New York to the Azores. The order followed the success of tests made with 120 miles of experimental "permalloy" cable off Bermuda last summer. The new cable differs from the old only in having a thin permalloy tape wrapped around the copper wire beneath the guttapercha insulation. It is expected to have a traffic capacity four times that of existing cables of the same size.

The invention of "permalloy" and "permalloy loaded cable" is possibly the most important development in the whole history of cable construction since the first trans-oceanic cable was laid. It has unusual significance, for it is the first radical change in cable construction in more than fifty years.

The new invention may mean the construction and laying of direct cables of a length hitherto impossible on account of costs or limit of traffic capacity. In fact, the possibilities of the new cable from a traffic carrying standpoint seem to be such that direct cables could be laid over much longer routes than there is any commercial necessity for.

While this new cable using permalloy does not forecast the replacement of any existing means of trans-oceanic communication, the fact that it offers a very large increase in traffic capacity over long distances will undoubtedly result in a realignment of the fields of various kinds of world communication. Its introduction will tend to clarify the situation regarding the dividing line between the real fields of radio and cable in trans-oceanic communication.

The new metal, "permalloy", is composed of about 80 per cent pure nickel and 20 per cent pure iron. It is the most easily magnetized and de-magnetized of all metals. This gives it peculiar value in submarine cable work where large magnetic effects are desired from small currents.

NEW X-RAY APPARATUS SHOWS METALS' INTERIOR

The development of an instrument that makes possible the investigation of the internal atomic structure of any metal or other substance has been made by Dr. S. J. M. Allen of the University of Cincinnati who is a research associate of the Carnegie Institution's Department of Terrestrial Magnetism, and is now working in the Cavendish Laboratory of Cambridge University under Sir E. Rutherford.

Previous methods of X-ray analysis have required that the substances to be examined should be in the shape of crystals or at least that the material be finely powdered. Dr. Allen's new apparatus allows the inspection of a piece of material in its natural commercial state without destroying its properties in any way.

X-rays are directed on the metal studied and the reflected rays are thrown on a photographic plate through the cracks in a series of very closely spaced lead plates which prevent all rays except those desired from reaching the negative.

Although application to commercial testing has yet to be worked out, it is declared that the new process is likely to prove of great value in routine and experimental testing of all sorts of materials in the near future.

READING REFERENCE - Russell, Bertrand. The A. B. C. of Atoms. New York, E.R. Dutton and Co., 1923.

SIMPLE SCIENCE

By WOW

(WOW is a professor of chemistry at a large university)

NITROGEN

Nitrogen always recalls to me the manure pile outside our cow-stable window. There's something rather cheery, and homey, and warmy about a farm manure pile. In the coldest weather it steams away like a miniature volcano, and the chickens love to scratch it over and warm their toes on it, and the old mothery sow loves to root about in it and toss the straw over her back. It's a sort of cosy-corner for all the farm animals. No farmyard picture is complete without it. It's the fundamental mother of all farm products. Without it, farm life perishes. It is a sort of index to country prosperity - the more manure the better the country.

It has health giving properties too, because when we moved to the farm the neighbors said, "just wait 'till you smell the manure all about, and you'll love the country, and get healthy and strong", and it really came true.

I know city folks hold their noses, and step on the gas when passing a freshly manured field, but, of course, that's because they don't understand. They think it's unhealthy, and all that. But the farmer understands. His business and pleasure is to make things grow, and that is how he does it. He's right at home among the manure, and the earth, and the growing things. He knows the manure contains nitrogen, and plants need lots of it.

The air contains nitrogen too, but the plants can't digest air nitrogen. Their digestive apparatus wasn't built for it. They have to take it in a camouflaged form - what chemists call soluble combined nitrogen. The manure contains this, so Dr. Farmer gives it to the plants, and they wax strong, and increase mightily, and all is well.

Now nitrogen, itself, is a gas, as you all know, and it comprises nearly 80 per cent. of our atmosphere. In this sea of potential food the plant must feel like Coleridge's Ancient Mariner, with "water, water everywhere, but not a drop to drink". But, happily, salt-water can be distilled, and unusable nitrogen can now be turned into usable nitrogen. The chemist does this by several methods. He can pass very strong sparks of electricity through the air, thus making nitric acid. He can pass nitrogen over hot calcium carbide, and the nitrogen sticks there, forming calcium cyanamid, which the plant can use. He can even make nitrogen to combine with hydrogen to give us ammonia. These all serve as food forthe plant. Then the plant makes food for us, and all goes happily.

Nitrogen has one bad fault - it's lazy. Then again, when you do succeed in getting it rounded up and stuck to something else, it watches for a loop-hole, and slips away. It's a sort of Methodist back-slider. When it breaks away it often causes a terrible commotion. It breaks up the whole camp-meeting at once, and all the good brethern and all the good-for-nothing onlookers get boosted to high heaven. That's what is called an explosion, and that's why it is used in explosives.

We have to eat a great deal of nitrogen, because our muscles are composed mainly of a substance called protein, which contains about 16 per cent. of nitrogen. We, like plants, have to depend on combined nitrogen, but we take it in the form of meat, nuts, etc. Vegetarians don't even eat meat, so they must be still more plant-like.

Lastly, as the parsons say, since explosives owe their explosiveness to nitrogen, success in war is mainly a question of nitrogen. If you can't get nitrogen you can't make war, no matter how many guns you have. But old mother nature has given us lots of it, so it looks as though she intends us to fight, or, perhaps, to just grow things. Nitrogen should be the God of War, not Mars.

READING REFERENCE - Slosson, Edwin E. Creative Chemistry. New York, Century Company, 1920.

When other means of communication were interrupted by the recent Japanese earthquake, pigeons were effectively used in the stricken zones to carry messages.

LONG DISTANCE STEAM GIVES POWER AND HEAT

A row of business buildings in Pittsfield, Mass., are now heated by the exhaust steam from a 750 kilowatt turbo-generator used by a local power company, says the Engineering News-Record in its current issue.

The steam is conducted to the generator through what is believed to be the longest high-pressure steam line in the world. It is 3,600 feet long, carries the steam at a pressure of 195 pounds, and is built partly under and partly above the ground. The pipe is eight inches in diameter and covered by three inches of insulation, consisting of two quarter-inch layers of fireproof felt over which is a layer of 85 per cent. magnesia; over this is a protective jacket of heavy duck, while, to waterproof the whole, a three-ply wrapping of roofing paper is used.

FROZEN NITROGEN CLOUD MAKES THE SKY BLUE

The blue color of the atmosphere is caused by a stratum of frozen, crystalline nitrogen in extremely high altitudes, according to theories recently put forward by Dr. L. Vegard. The aurora borealis and zodiacal light are attributed by him to the same cause.

Dr. Vegard asserts that there is some point in the upper atmosphere where the temperature must fall as low as 350 degrees below zero Fahrenheit. If so, nitrogen, the main constituent of air, must freeze, even as snow is formed in an ordinary wintry atmosphere. The resulting nitrogen frost is likely to remain in a dispersed state. Dr. Vegard also assumes that it is electrically charged.

Inasmuch as the atmosphere is shallower near the poles than at the equator the air-frost would approach the earth more closely in polar latitudes. More light disturbances would therefore occur in such regions.

The presence of nitrogen at such great altitudes as must be necessary to get temperatures as low as 350 degrees below zero is accounted for by Dr. Vegard by the repellent effect of the electrical charges which these particles are assumed by him to carry. Temperatures at the highest levels at which observations have been made, or about 12 miles, have seldom been found lower than 85 below zero, and the temperature shows no tendency to decline further beyond that point.

Dr. Vegard suggests that this outer shell of nitrogen frost-cloud may act also as an envelope for the atmosphere and prevent it from diffusing into space.

Sweet clover, formerly considered as only a troublesome weed, is now extensively planted as a valuable soil improver and fixer of atmospheric nitrogen.

PLANT VEINS SERVE THEM AS NERVES

The vascular bundles of plants have been found to serve a purpose similar to the nerves of animals, Prof. Henry H. Dixon, F.R.S., told an audience at a lecture in Dublin recently. These vascular bundles not only carry raw food material from the roots to the leaves but also transport the "chemical messengers" which take the place of nerve impulses, the speaker said.

The similarity of distribution of the vascular bundles in plants and that of the nerves in animals was noticed long ago, but as the details of the two systems were worked out differences between the two became accentuated rather than the similarities; now the latter are receiving more attention. In both cases a stimulus given to one part of the body often causes a reaction in a different part. If the tap-root of a plant be artificially deflected from the vertical, a stimulus is set up in a cell just behind the root tip, which results in a bending of the root at that point till it is again growing vertically downwards. Again, when the tip of a grass-seedling is illuminated on one side a stimulus is transmitted thence downwards to the shaded part and causes curvature there.

It has been shown that the stimulus is propagated through some plants at a rate of 10 to 20 millimetres per second. This speed, though slow compared with the velocity of transmission of stimuli along animal nerves, is fast among plants. Scientists are beginning to believe that the stimulus is conveyed by chemical messengers or "hormones" liberated by the stimulated part into the transpiration stream.

In Professor Dixon's words: "Whatever the intimate mechanism of the system is, the subject of the transmission of stimuli through plant tissues offers a striking example of the swing of the scientific pendulum of scientific opinion. The view based upon superficial resemblances, that the vascular bundles are the nerves of plants, was long abandoned, but now we see there is clear evidence that they actually transmit stimuli from the sensory to the motor regions, and so perform the functions of nerves;" but there are very great differences in detail between the modes of action in the two cases.

READING REFERENCE - Ganong, W. F. The Living Plant. New York, Henry Holt & Co., 1913.

Sorauer, Paul. A Popular Treatise on the Physiology of Plants For the Use of Gardeners or for Students of Horticulture and Agriculture. New York, Longmans, Green and Co., 1895.

NUTS

Great trees from little seeds may grow - sometimes. Experts of the U.S. Forest Service have found that on many of the western yellow pine forests in the Northwest second growth pine is not multiplying as it should. The older trees are there. These trees bear plenty of cones. These cones carry enough seed to start the new growth. But the seed never gets a chance to dig in. Squirrels collect and store the potential forest for their own use.

NEW BIOLOGICAL STATION LOCATED IN CANAL ZONE

The wild, virgin jungle of Barro Colorado Island, in Gatun Lake just off the steamship channel of the Panama Canal, will soon be the center to which scientists seeking the secrets of little known animals and plants will flock. Construction of a biological station on that island has been begun by the Institution for Research in Tropical America, in which over twenty of the leading museums, societies, and universities of the United States are cooperating, Dr. A. S. Hitchcock, chairman of the executive committee of the organization, announced recently at the Smithsonian Institution in Washington.

The island was created by the formation of Gatun Lake in the building of the Panama Canal. It was one of the high spots in the tropical jungle which was submerged to make the Lake, and contains over 3,000 acres. As the waters arose in the Lake, the forest animals took refuge on it in unusual numbers. Many jaguars, tapirs, and other large animals are known to exist on Barro Colorado, which is also an insect paradise and rich in plant material.

Last June the government set the island aside as a reservation for biological research. No hunting, tree cutting, or settlement is allowed on it. The Institution for Research in Tropical America has been given custody of it and is now proceeding to erect a laboratory where biologists, entomologists, zoologists, and botanists may find shelter for their apparatus and a place to set up their cots. James Zetek, of the U. S. Department of Agriculture, is serving as the local custodian of the station.

Barro Colorado is only a mile and a half from Frijoles Station on the Panama Railway ten miles from Gatun and ten miles from Gamboa. But although easy of access, the scientists working at the laboratory will literally have the wild at their door. Within a few feet of the station now under construction there is abundance of unstudied plants, animals, and insects. The building will be screened and protected against the wood eating ants which abound in the tropics.

Not only has this government recognized the importance of Panama as a field for biological study, Dr. Hitchcock said, but the Republic of Panama also recently set aside a beautiful site for a Marine Biological Station on the bay front in the modern section of the City of Panama, next to the site of the Gorgas Memorial.

The Institution for Research in Tropical America operating the Barro Colorado site was initiated by the National Research Council and is an association including representatives of the American Anthropological Association, American Museum of Natural History, American Phytopathological Society, American Society of Agronomy, Brooklyn Botanical Garden, California Academy of Sciences, Carnegie Museum, Commercial Museum of Philadelphia, Ecological Society of America, Harvard University, Indiana University, John Hopkins University, National Geographic Society, New York Academy of Sciences, New York Zoological Society, University of Michigan, Philadelphia Academy of Sciences, Smithsonian Institution, Yale University, University of Florida, American Genetic Association, and the National Research Council.

READING REFERENCE - Thomson, J. Arthur. The Haunts of Life. New York, Harcourt, Brace & Co., 1922.

SALMON CROSSES OCEAN TO VISIT FORMER HOME

Fish No. 10358, one of the 10,000 salmon caught, tagged, and released by the United States Bureau of Fisheries south of Alaska last season, has turned up in a Siberian stream 2,000 miles across the ocean. He made the trip to get to his wedding at the old home stream where he began life as an egg.

This remarkable tale of Fish No. 10358 is not a mere fisherman's yarn but is backed up by scientific records on two continents. According to the files of the Bureau of Fisheries here, No. 10358 belonged to the Oncorhynchus keta or dog salmon family. The identification tag stamped with this number was clamped on his tail last Fourth of July off the north shore of Unga Island, Alaska.

Released to go his own way, No. 10358 evidently lost little time heading for home. According to word recently received from the Far Eastern Bureau of Fisheries, the fish wearing the tag marked "U.S.B.F. No. 10358" was caught on August 18 in the river Pankara in the district of Karagin on the eastern shores of the peninsula of Kamchatka. The local residents did not pay any attention to this mark and the fish was cleaned and salted. Agents of the Far Eastern Fisheries Board at Vladivostok discovered No. 10358 in the preserved state.

Examination showed that the fish was a male and had grown teeth. As salmon return to spawn in the same stream in which they were hatched from the egg, it was plain that No. 10358 was a native of Kamchatka. Other tagged fish of the dog-salmon family have been retaken in Alaskan streams to the east of the feeding ground where they were tagged.

PORCUPINES

The "fretful porcupine" as Shakespeare called him, is causing a lot of fretting on the part of forest officials in parts of the National Forest Reserves. The little animals are reported to have destroyed many of the trees planted in sample plots; and they are making difficult the introduction of yellow pine into the forests of the southwest. The bark of these trees is tender and succulent, and the porcupines regard it as a delicacy, a taste which is fatal to the young trees. The Department of Agriculture is now seeking a way to preserve both the trees and the porcupines.

SMOKE

Every time a ton of coal is burned in the family furnace, 17 tons of gas go up the chimney. Sixteen tons of these are the gases of the atmosphere, either free or in combination with the elements of which the coal is formed. Twelve of these tons and a little more are of nitrogen, which goes through the fire unchanged. Nearly four tons of oxygen are needed to really burn the coal and this oxygen all goes up the flue as carbon dioxide, sulphur dioxide, and water vapor. Most of the coal, 1500 pounds or so also goes up the chimney, mostly as carbon dioxide, less than one part in a hundred forming smoke.

GREAT PORTUGUESE LIBRARY OPENED IN WASHINGTON

The third largest library of Portuguese literature, and especially of that produced in Brazil concerning the history and development of that country, has just been opened in this city. It contains 40,000 volumes and is the gift of Dr. Manoel DeOlivera Lima to the Catholic University of America. Dr. Lima is a Brazilian and was for many years in the diplomatic service of his country. The library was collected during a period of forty years and contains many rare works, which are not to be had in any library of Portugal or Brazil.

The collection, which is surpassed only by one in Lisbon and one in Rio Janeiro, is valued at $500,000. It contains also many rare prints and engravings and will eventually be housed in a building at the University to be erected solely for that purpose.

MT. EVEREST CLIMBERS TO START NEXT MONTH

A new expedition to conquer Mt. Everest, the highest peak of the Himalyas and the highest mountain in the world, will leave Darjeeling in northern India towards the end of March. It will be commanded by General C. G. Bruce who commanded the expedition that almost achieved the goal last year, being forced to turn back when only 2,000 feet below the summit. More than half of the expedition will be composed of those who took part in the effort last year. A new type of oxygen apparatus for use above 20,000 feet will be used. The final attempt on the summit will be made toward the end of May.

SCIENCE FIXES STANDARD FOR HONEY COLOR GRADES

The most extensive study of colors of honeys ever undertaken has recently been completed at the Bee Culture Laboratory of the U. S. Department of Agriculture, according to Dr. E. F. Phillips, in charge of the work. This investigation is expected to result in the standardization of the grading of honey according to color and eliminate much confusion in the honey trade.

Commercial graders now on the market differ widely in the number of grades and the color shades used to indicate the differences. In the work just finished, the scientists secured the most complete collection of American honeys ever made; including samples from every state in the Union and several foreign countries representing 450 gradation from clearest water-white to the darkest amber. From this collection they have worked out eight standard color shades with which any given sample of honey can be compared to determine its proper grade.

As honeys change in color with time, the honeys themselves could not be used in the series of bottles which will serve as containers for the grade colors. It was necessary to devise chemical materials corresponding in color and opacity with the fresh honeys.

To do this, light transmitted through the various honey samples was measured

by the spectro-photometer. This instrument breaks up the transmitted light into its various color waves by means of a prism. Substances were then prepared synthetically which would have fast colors which would transmit light with wave lengths corresponding to the wave lengths transmitted by the different grades of honey.

The government will place its findings at the disposal of all the manufacturers with directions telling how to make the standard graders. In the collections of honey made for this study, the lighter grades came mostly from the north and the darker grades from southern and tropical regions. This is believed to be due to the fact that the southern bees gather their raw material mostly from trees and the northern bees from smaller plants.

TABLOID BOOK REVIEW

"CONQUERING THE EARTH" The teacher or librarian who is looking for "human interest" material to illustrate the historical development of mining and engineering from the earliest ages should procure the beautifully printed volume of that title sent free by the Advertising Department of the Hercules Powder Company, Wilmington, Delaware.

CARRIER PIGEONS IN THE DESERT

An interesting application of carrier pigeons to useful peace-time work is seen to be tried by the National Park Service in the opening up of the large region east of the Grand Canyon National Park. New roads have been opened through this section, uninhabited except for wandering bands of Navajo Indians. Touring cars will take passengers across the desert to points of interest. To guard against delays from breakdowns, and to keep park headquarters informed of them, carrier pigeons will be carried in these cars and released in case of difficulty. This service may be increased to include private messages from passengers.

LOWLY WORM'S TRACK PRESERVED 100,000,000 YEARS

Among the humblest of all living creatures is the sandworm. Yet there was once a family of sandworms in Sweden which made so fine a record of its wanderings that it has been preserved a hundred million years.

This has been brought to light through the discoveries, just made, of various fossils of the Cambrian period, the earliest period of the Paleozoic Age, at Narke, in the central part of Sweden. The worm tracks, known as arenicolies, consist of tube-like forms in the rocks, which are believed to have been left by the passage of worms through sand which afterwards became petrified. Dr. Westergardh, one of the state geologists, who has examined these finds, reports that, while similar fossils have previously been discovered in Sweden, these are particularly valuable because of the unusually fine preservation. He fixes the age as about one hundred million years.
