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COOPERATION IN LOW LIFE

By Dr. Edwin E. Slosson.

The more we learn of animal and plant life the less it seems like a chaos of incessant conflict and carnage, and the more it seems like a universal scheme of unconscious cooperation. The struggle for existence is real, war to the death, to the strongest belong the spoils, everyone for himself, the weak to the wall, and all that. But also we find on closer inspection more than we thought of mutual aid, not only between individuals of the same family or pack or species, but between species of the most widely different sorts, and sometimes it turns out that what seem to be inveterate enemies are actually involuntary allies.

Many an animal owes his success in life to the unrecognized cooperation of the humblest creatures. For instance, it is a great advantage for fishes and other marine forms to have a lighting system for use at night and in the depths of the sea. Some have glands that secrete the two kinds of chemicals that produce light when mixed. But many others depend upon luminous bacteria, of which some thirty species are known. These live in certain glands or stream through tubes which serve as lamps to the lost. The cuttle-fish has gone so far as to fix up a reflector behind and a lens infront of its light-giving colony of bacteria. In the glow-worm the bacteria are also present in the beetle's eggs, which are likewise luminous.

Bacteria and other micro-organisms are often found aiding digestion by attacking substances that their hosts would find too tough to tackle alone. Vegetable foods, for instance, contain more or less cellulose, wood fiber, which is extremely indigestible stuff, and even cattle could not get nutriment out of it if it were not for a process of internal fermentation. The so-called "white ants", termites, terror of the tropics, get their living by eating the insides out of furniture and books, yet they cannot digest such cellulose. What they do is to chew it up and turn it over to fungi, which thrive on it and then the termites feed on the fungi.

Flies lay their eggs in meat but the larvae when they hatch out can not digest the meat without the help of the bacteria in their intestines. Peas, beans and alfalfa owe their power of utilizing the nitrogen of the air to the bacteria that colonize on their roots in the form of nodules. Most plants can not use free nitrogen but have to have it served up to them in the form of salts such as nitrates. The root nodules therefore might be called the Muscle Shoals of the plant world but that would not be a fair name for them since they are working.

The tubers of the potato are due to a parasitic fungus. Potato seeds

planted in sterilized soil do not produce tubers but when the fungus is allowed to invade the soil tubers start to grow. If you should ask a young potato plant whether it wanted to be infected by a fungus, and if the potato were as intelligent - or rather as unintelligent as men are - it doubtless would reply that its pristine purity must remain unimpaired by any parasite. Yet that refusal would deprive the plant of its chance of perennial life and, what's worse, deprive us of potatoes. It has been found that orchid seeds do not sprout unless a certain fungus is present, and each species of orchid has to have its particular species of fungus.

The lichen on a tree or stone seems to us a simple single growth but it really is a partnership of two very dissimilar forms of vegetation, a plant and a parasite, an alga and a fungus. Which is to be regarded as the host and which the parasite, which was originally the patient and which was the disease, can hardly be determined since the relation varies in different lichens, and the two strange associates have been living together so long now that they play into each others hands and could hardly stand it to live alone.

So it happens that a plant or animal gets used to a chronic disease and finds it advantageous, and a parasite that came to prey remains to serve. Dr. Nuttall of Cambridge who at the Liverpool meeting of the British Association for the Advancement of Science gave these and many other instances of cooperation, or symbiosis as biologists call it, thinks that they all began as cases of parasitism but that the conflict between the associated organisms ended in mutual adaptation. The two enemies become allies and the parasite becomes a partner.

GIANT PLANETS NOW IN VIEW

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

The two largest planets of the solar system, Jupiter and Saturn, are now in fine position for observation in the evening.

Saturn will be found nearly due south at 9 o'clock in the evening in the constellation of Virgo, The Maiden. It is yellowish in color and about twice as bright as the white, first magnitude star Spica, the brightest star in Virgo, lying a little to the west of it.

Jupiter isjust appearing above the southeastern horizon at this time and is by far the brightest object in view, now that Venus is drawing in toward the sun and setting earlier in the evening. On the date of its opposition with the sun, Jupiter wil be on the meridian at midnight and will be visible throughout the night.

If it were possible to take the stuff of which these two huge worlds are made and fashion them into many balls the same size as the earth, 1309 earthglobes could be made out of Jupiter and 760 out of Saturn, not counting the material that exists in Saturn's rings. This would be by no means a negligible quantity for though the ringsare mere sheets, scarcely one hundred miles in thickness, their width is enormous. The inner, dusky ring is nearly eleven thousand miles wide, the middle or bright ring is eighteen thousand miles wide, and the outer ring which is less bright than the middle ring is 11,000 miles wide. These widths total nearly 40,000 miles, more than half the diameter of the planet itself. Then there are the satellites, then belonging to Saturn, nine to Jupiter. These

are good-sized worlds, some of them larger than our moon, two as large, or larger, than Mercury. We could get a few more globes as large as our own from this material.

Compared to our own substantial planet, though, these globes would be rather flimsy worlds. The material of which Saturn is made has only six-tenths the density of water. A ball made of it would float, like those the children toss about in the water in summer. The Jupiter globes would be more molasses-like in their consistency or rather like the dense, compressed vapors of which the main body of the sun consists. The sun and Jupiter are almost the same in density and Jupiter is believed to be a very small sun that has cooled off.

Compared with these globes, our own earth, with an average density twice that of its surface rocks, is like a ball of iron. Possibly our earth has a core of iron. Its interior may be made of the same stuff as the iron meteorites that get trapped by the earth's atmosphere now and then and fall to the surface of the earth. Some think these are fragments of an exploded world or remnants of the stuff from which the solar system was originally fashioned.

Now is an opportune time to take a look at either of these giants of the solar system. Even a small, three-inch telescope will show much that is interesting on either of them. The rings of Saturn are now well opened up and present a unique and beautiful sight. You may see the belts running parallel to the planet's equator and at least one or two of the brighter satellites. On Jupiter you will see the belts very clearly, andthe white spots and splatches of color, too. Perhaps there will also be visible a satellite or its shadow projected on the disk. Or by chance another of its satellites may be caught suddenly disappearing as it dips into the shadow of the huge planet.

Now is the time to find a friend with a small telescope or take a trip to your nearest observatory and get a glimpse at the wonders of the worlds around you.

RAINY SPELL DUE TO WARMER OCEAN

Unusually warm water in the northwestern A tlantic ocean and especially over the Grand Banks of Newfoundland is considered by U. S. Weather Bureau experts as a very likely cause for one of the wettiest months of May in years. The presence of this warm region in the Atlantic was discovered by U. S. Coast Guard cutters on the International Ice Patrol and was first reported by Science Service.

An abnormal number of areas of low barometric pressure, or general storms, have crossed the United States during the past few weeks. Their course has been unusually far to the south for the time of year, causing warm, moist south winds bringing rain to nearly all the country east of the Mississippi river.

The reason for the southerly track of these storms is stated by the Weather Bureau to be a big low pressure area which has settled down over the Grand Banks for weeks. Such a distribution of the pressure of the atmosphere causes northerly winds along the northern border of the United States, bringing cool air currents which serve to push the eastward moving low farther to the south, and which also by running under and pushing up to the cold regions of the upper atmosphere the moisture laden winds from the south cause frequent and abundant rains.

The reason for this persistent low air pressure over the Grand Banks is

said by the Weather Bureau to be probably due to the reported warm water in that region. The Ice Patrol reported several weeks ago that the temperature of the ocean water over the whole area of the Banks, a matter of thousands of square miles, was 7 degrees warmer than normal for the time of year. Warm ocean water means that the air above it is warmer. Warmer air weighs less than cold, hence warm ocean water is apt to be covered by a region of low air pressure such as has actually been present near Newfoundland.

The ultimate reason for the warm ocean water is unknown; nor would the Weather Bureau make any prediction as to when or how the present run of bad weather over the east would break up. Rain breeds rain they said, for more moisture evaporates from wet soil than from dry, and this gives greater humidity to the air.

The month has been wet everywhere east of the Mississippi but to the westward dry weather has been the rule. Cool weather has prevailed generally east of the Rocky Mountains. Planting of corn and cotton has been seriously delayed in the east, but small grains, potatoes and fruits have been generally benefited. In the western portions of the corn belt and of the wheat growing sections, cool dry weather has retarded crop development.

BRITISH INVENTOR CLAIMS DEATH RAY USES SMALL POWER

Use of the so-called death ray announced by Dr. T. F. Wall, lecturer in electricity and mechanics at the University of Sheffield, England, involves the transmission of relatively small amounts of electrical energy through space in any desired direction without the aid of connecting wires. Dr. Wall gave this information in response to a request from Science Service.

" In order to destroy life it is not necessary to use an appreciable amount of power," he said in explaining the energy to be used by his invention in dealing destruction to living matter at a distance. "Life is destroyed by shock and the power involved need only be very minute if the voltage applied to the living being is, say, of the order of 500 volts."

The power necessary for the projection of the ray will therefore depend upon the purpose for which it is to be used, Dr. Wall explained, but the sending of electrical energy in predetermined directions and without the use of intermediate transmitting wires is fundamental to the invention.

Interference with the sparking devices and magnetos of automobiles, airplanes, and other vehicles using the internal combustion engine, according to Dr. Wall, "involves somewhat different considerations" from the methods used when the new device is turned upon living beings.

Dr. Wall is the inventor of a new type of squirrel cage motor. At the meeting of the British Association for the Advancement of Science in 1921 he also presented an ingenious plan for the long distance transmission of electrical energy generated by tidal power. The chief difficulty in the utilization of such power has been the fact that the head of water is changing and this causes extremely large variation in the speed of the turbines used to drive the electrical generators, and consequently the electrical current produced fluctuates. Dr. Wall proposed the use of an arrangement that would cause the frequency of the alternating

current to vary with the speed of the turbine so that a current of constant voltage would be delivered to the consumer.

TOOL USING INSECT FOUND BY SCIENTISTS

The definition of man as a tool-using animal may have to be revised. In a letter to Science, two observers report having seen a wasp using a pebble for tamping down the entrance to her burrow.

The incident happened in Texas where Dr. George C. Wheeler and Esther Hall Wheeler of Syracuse University were studying insect life. Aroused by a loud buzzing they stood their ground with true scientific intrepidity and caught sight of the wasp at work. The insect was holding the pebble between her mandibles and striking it against the ground by moving her whole body up and down after the fashion of a pile-driver. The scientists captured the wasp but the pebble was lost in the excitement; it was about one-fifth of an inch in diameter. The tamped filling of the burrow was quite compact and remained intact when the surrounding soil was dug up.

CHILD RAISING AND SCIENTIFIC RESEARCH CALLED WORLD'S GREATEST WORK

Creation in science and art, and the bearing and raising of children were declared "the most important work in the world" by Dr. J. McKeen Cattell, editor of Science, who delivered the commencement address of the University of Arizona, recently. Dr. Cattell pointed out: "These are exactly the kinds of service that are not professions. Mothers are neither trained nor paid; scientific men have been amateurs who get or earn their living in other ways.

" Children, like less precious products, must be manufactured before they can be used," he said. "In past times the instincts of the parents were supplemented by the prospective uses of the child, and this still holds to a certain extent, especially on the farm. But if we require education and forbid child labor, as we should, then we become parasitic on instincts likely to atrophy amid complicated and conflicting stimuli.

"The maker of wine may spend twenty years in perfecting his product, for he can then dispose of it at a profitable price. By abolishing this and similar occupations we now save several billions dollar a year, with considerable infringement on individual freedom for what is supposed to be the public good. Why is it not equally within the province of government to defray the cost of raising desirable children or to pay their parents what they are worth to the community and the nation at the age of twenty years?

"Such a proposal may seem like sacrilege in holy shrines. But a mother does not care less for her child because it is born in lying-in-hospital or goes to a public school. If at the age of twenty each child were appraised by psychological and physical tests, by his heredity and life history, and the state then paid to the parents his estimated value - namely, what his most probable excess of production over consumption would be - including ideal values such as were contributed by the holy mother of Galilee or by Socrates and Dante - we should enter into a new scientific and eugenic social order.

"It is the big scandal of our competitive civilization that man can obtain

vast incomes and enormous fortunes by exploiting others, but can not earn even a humble living by rendering services to society.

"The behavior of parents and of investigators indeed results from the most fundamental of instincts. We inherit from remote ancestors the compelling attraction of sex, the need of a home, the love of offspring; we share these with other mammals and with birds. In like manner scientific research has resulted from the instincts of curiosity, of collection, of play and of emulation."

ELECTRICAL METHODS LOCATE SWEDISH MINERALS

Unique methods of electrical sleuthing have resulted in the first discovery of arsenic deposits in Sweden together with new discoveries of large iron pyrites and copper deposits. These facts have just transpired from a request made by the government Board of Trade to the Swedish Riksdag for appropriations to carry on further investigation.

The new mineral finds are in Vaesterbotten Province in the northern part of Sweden. According to preliminary estimates the new mines when worked will yield annually 350,000 tons of pyrite, 25,000 tons of copper ore, and about 40,000 tons of arsenic ore. The last-named ore contains about 30 per cent arsenic. This discovery is of great industrial significance as Sweden has hitherto been entirely dependent on imports of the commodity. The newly-found copper ore contains from 4 to 8 per cent of copper, while the iron pyrites will yield from 40 to 45 per cent of sulphur.

The method by which these ores have been detected has been invented and employed by Karl Sundberg, a Swedish mining engineer, and illustrates how far this branch of science has advanced since the days of the hazel bough. The testing for ore is made entirely by the use of electrical instruments which indicate not only the whereabouts of ore, but also its nature and quantity. In connection with these tests Mr. Sundberg has engaged in some geologic sleuthing. Whenever he has discovered stray blocks of ore near the surface he has assumed that these have been carried some distance by glaciers, and has consequently assumed the existence of extensive deposits in the direction from which the glacier had apparently moved. This theory combined with the electrical detecting has led to the rich results now reported.

NEW STYLE BEARING WILL CONSERVE OIL

A saving of millions of quarts of lubricating oil, and of millions of dollars in money is predicted as a result of the invention by the Westinghouse Electric and Mfg. Co., of what is said to be the first sealed sleeve bearing in the history of industry. The new device prevents waste by sealing the oil in and the dirt out of the bearing.

The new bearing is said to be no more complicated than the conventional sleeve type motor bearing, but it is claimed to be immune from injury due to dirt present in the air surrounding the motor, since no air enters the bearing. Clean oil is always present between the bearing and the shaft, and the life of the oil is determined not by the amount of impurities it contains but by the time required for the oil as a lubricating medium to break down.

WAR UNCOVERS ROMAN COIN SHOWING LONDON OF 296 A.D.

While digging in war ruins near Arras, a French workman has found a Roman coin of extraordinary interest to the antiquarian and student of history. It is a gold coin, one and a half inches in diameter, and in value the Roman equivalent of the English sovereign, or the American five dollar gold piece. It commemorates the relief of London from an invasion of Frankish barbarians by the Roman general Constantius in the year 296 A.D.

The coin shows the Roman general, who was the father of Constantine the Great, being received in grateful homage by the city of London, following its deliverance. The town is shown as a fortified place with a gate and wall, and is identified by name underneath. The coin carries the curious legend, "Redditor Lucis Aeternae", "Restorer of Eternal Light". This may be a symbolic expression of restoration to the blessings of civilization, but by some it is thought to refer to the cult of Mithras, then popular throughout the Empire, and of which the Roman general was a devotee.

ANNUAL CONFERENCE PLANNED ON OUTDOOR RECREATION

Wholesome play in America's great outdoors for adults as well as children is now a matter in which continued interest on the part of the federal government and numerous organizations is assured.

As the result of the National Conference on Outdoor Recreation held in Washington at the call of President Coolidge, a permanent organization has been effected which will result in a regular annual conference of government representatives, naturalists, scientists, forestry and park experts, sportsmen and representatives of all organizations interested in playgrounds, scout movements, child welfare and other such activities.

At the conference the wild life and scenic resources of the country were surveyed by delegates from scientific institutions and national and state parks.

Every city and town was advised by resolutions of the conference to secure for the general recreational use of its people a piece of land which would be maintained in its wild state as near as possible. Action leading to the preservation of wild animals and wild flowers was also recommended.

As the executive committee of the permanent conference, the following were closen:

Chauncey J. Hamlin, New York; Dr. Vernon Kellogg, California; Colonel W.D. Martin, Washington, D.C.; Dr. John C. Merriam, California; John Barton Payne, Illinois; Mrs. Jane Deeter Rippin, New York; George Scott, Illinois; Charles Sheldon, Washington, D. C.; Mrs. John Dickinson Sherman, Colorado; George Shiras, Michigan; James E. West, New York.

Lightning rods should not be insulated from the buildings which they are designed to protect.

GOITER ABUNDANT WHERE IODINE IS VERY SCARCE

Further confirmation of the relation between a lack of iodine and the presence of goiter is presented in a report to the American Medical Association by Dr. J. F. McClendon and J. C. Hathaway of the University of Minnesota. They have analyzed samples of drinking water and of food from all parts of the country. They found that where iodine is very rare, goiter is very abundant.

Water from Lake Superior near Duluth, and drinking water from Spokane and from Rockford, Ill., contain only about one part of iodine to one million parts of water. All these places are in regions where goiter is relatively common. On the other hand, water from Mexia, Texas, and from Stanford, Calif., where goiter is exceedingly rare, was found to contain respectively 18,000 and 10,000 parts of iodine per million of water. If regions in which the proportion of iodine in the water is less than 22 parts per million be charted, the map closely coincides with one in which high percentages of goiter in human beings is found. Sault Ste. Marie, Mich., and Rochester, N.Y., are adding small amounts of iodine to water in the city reservoirs as a preventive of goiter.

BABY'S TOES PROVE LINK WITH PREHISTORIC ANCESTORS

Tickle your baby's toes and you will get evidence that he is descended from primitive ancestors who lived in the trees and were akin to forebears of the arboreal apes of today.

So declares Dr. Carl Dudley Camp, professor of neurology at the University of Michigan.

Toe tickling reveals that the new-born babe can clutch with its toes as could its primitive tree-dwelling ancestors millions of years ago, he says.

Here is a curious fact: If you tickle a baby's toes enough the big toe will turn up and the other toes spread out with a fan-like motion. But if you tickle a grown person's toes they will turn down instead of up, because in walking adults have acquired the habit of gripping the ground.

If an adult's toes turn up instead of down when they are tickled, says Dr. Camp, it suggests something is wrong with the spinal cord, probably as a result of disease. Recently when a patient was thought to be subject to hysteria, he tickled his toes, observed that they turned up, and discovered that a serious ailment affecting the spinal cord probably was to blame. He examined the fluid from the spinal cavity and found full confirmation of the presence of specific disease.

BIG DIESEL SHIPS NEAR COMPLETION

Shipping circles are much interested in the forthcoming completion of the two largest liners to be equipped with Diesel engines. The larger of these is the Aorangi, 20,000 tons, but she will not be finished quite as soon as the Monte Sarmiento, 14,000 tons, under construction for the Hamburg American Line by Blohm and Voss of Hamburg.

This latter vessel will be equipped with twin screws driven by four Diesel engines, each of 1,750 horsepower. Mechanical reduction gear will be used so that the motors will run at 217 and the propellers at 77 revolutions per minute.

Several smaller Diesel engine vessels are on the ways, among them one designed for cross-channel cargo and passenger service.

RADIO AND SOUND WAVES USED IN SEA SURVEYING

A new method of marine surveying using both radio and sound waves has been developed by the U. S. Coast and Geodetic Survey with the cooperation of the U. S. Bureau of Standards, and is now being used in surveys of the Oregon coast. It may be used even in a dense fog and is as accurate as any of the usual methods of sight surveys at sea.

The method depends of the velocity of sound through the sea water which, if known, enables the operator on shipboard to fix his distance from two or more known positions on shore. A simple calculation then permits him to work out his own position. In this method a bomb fired under water near a vessel sends out a sound wave which travels till it reaches an underwater telephone near and connected by cable with a shore radio station. The sound itself by means of suitable apparatus sends back a radio signal to the ship in such a way that, while there is a delay in the return of the signal, this delay can be accurately measured and the result is the same as if there were no delay whatever.

The procedure has been worked out especially for application to surveys to be made along the North Pacific Coast where weather conditions make difficult or even impossible ordinary methods of surveying during a large part of the year. In winter the sea is usually too rough to permit accurate work, while in summer when the sea is smooth , fogs and haze abound, cutting off visibility and making sight surveys impossible much of the time. The Coast Survey steamer Guide is now at work off the Oregon coast, using Marshfield as a base.

As to the accuracy of the method, Commander N. H. Heck, who has been supervising the work, states that at a distance of 10 miles from shore it gives the position of the bomb explosion to within a circle whose diameter is the length of the survey ship. This is accurate enough for the best surveys giving the positions of rocks or other dangers to navigation.

A less accurate modification of the method, cutting out the expensive chronograph on the ship, may be of practical use in navigation. Use of a stop-watch for timing would give an error of at most two-tenths of a second, which would enable a vessel captain to work out his position with sufficient accuracy for ordinary navigation.

As to the distance from shore at which this method of sound ranging is practicable, Commander Heck said that during experimental work in Long Island Sound last fall, a small bomb was distinctly heard at a distance of 55 miles.

Every woman in Australia who gives birth to a child is paid $25 by the government.

SUBMARINE EARTHQUAKE LIGHTS UP THE OCEAN

A remarkable combination of a submarine earthquake and phosphorescent seas has been reported to the Hydrographic Office, The stirring up of the ocean brought so many light-emitting organisms to the surface that the British steamer Trefusis on her way from Aden to Colombo seemed to be steaming across a snow-covered plain.

It was during the middle watch of March 18, a dark night, quiet sea, and as usual in the northern Indian ocean, the wake of the ship rather brilliantly phosphorescent while the rest of the sea was dark. Just before four o'clock a distinct tremor was felt, followed quickly by others, as if a series of mines were being set off at great depths. Immediately, great patches of light rose to the surface and spread in all directions until for miles around the ship the whole ocean was a brilliantfoaming glitter of phosphorescence, the pale blue glow lighting the decks of the vessel with a weird light.

POWER PLANT TO USE TRIPLE USUAL PRESSURE

The power station which the Edison Electric Illuminating Co. of Boston is erecting at Weymouth, Mass., will operate boilers working under a pressure of 1,200 pounds to the square inch. This is five times the pressure of the most powerful locomotives, and three times that ever before used in a commercial power station.

Parts of the boiler must have the strength of a cannon. The boiler drum will be 34 feet long, with walls of solid steel four inches thick, and is being forged in the ordnance shops of the Midvale Steel Co., famous for their great guns. The original unit of the plant will be 60,000 H.P., but the plans involve 400,000 H. P. with boilers and turbo-generators housed ina building 145 by 800 feet, 125 feet high. The stacks will far overtop Bunker Hill Monument, and their interior diameter will be so great that a street car could be lowered from top to bottom without touching the sides.

The Edison Co. Lighted the first incandescent lamps in Boston 38 years ago. when the old Bijou Theater was illuminated "by those new electric lamps that burn in glass bulbs", and Thomas A. Edison himself was at the switchboard that night, while "Iolanthe" was being sung for the first time in the Hub.

BLACK WALNUTS

The recent demand for black walnut as a cabinet wood has resulted in the discovery of a number of native species which have nuts of a superior cracking quality, and the planting of the trees is assuming economic importance. The trees do well on any fertile, loamy soil, where the winters are not too cold and where rainfall is abundant. The whole region of the Ohio Valley and the lower Mississippi valley below the mouth of the Ohio is adapted to their growth as are the rich bottom lands of the Middle and South Atlantic states.

A number of large yellow sapphires, some of them weighing between 350 and 450 carats, were recently discovered in a rice field in Ceylon.
