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OUR UNEASY EARTH

By Dr. Edwin E. Slosson

Whenever a shake-up like that in Japan occurs we take thought of our underpinning. Is this solid earth so solid as it seems? Is not the crust likely to cave in any time, and if so what sort of a furnace will we fall into? Will the earth open her mouth and swallow us up and our houses and our goods and close in upon us as it did upon the men of Korah who ventured to oppose Moses?

Such fears we may well have felt in our youth when we were taught that the earth was a molten mass held in by a thin solid crust. As the hot kernel of the earth cooled it would naturally shrink away from the outer shell, leaving it unsupported like the ice bridge over a dwindling stream. No, that is a highly inappropriate simile, let me say rather like an ill-baked cake. Perhaps the basaltic dough out of which our world was molded might not have been mixed right and might collapse in the cooling with disastrous results to us animalculae who dwell upon its upper crust.

Also we used to be told that this shrinkage of the earth caused a crumbling of the crust into mountain ranges, and the professor of geology showed us just how it was done by rumpling up the table cloth or the pages of his manuscript by shoving his hands together from both sides. We therefore lived in dread lest a new Himalaya might arise at any moment in our midst and catch us on its peak or slippery slope.

But better knowledge of the composition and character of the materials that form our globe has given new ideas of its interior and new theories of its mountain formation and earthquakes. It is now held that the earth is as rigid as steel to sudden shocks and as plastic as putty to long continued pressure. Don't say that is an impossible combination of qualities, for you can easily prove that it is not. If you give a sharp tap to an ordinary phonograph record you will knock a piece out of it. On the other hand if you lay it on an uneven surface and pile books on it you know that the disk gradually warps out of shape and gives awful music. So the earth, behaving like a rigid body, will crack under a local strain and transmit the vibrations of it swiftly to all parts of the world and yet the continents float upon its plastic mass so stably that their rise and fall is imperceptible. The pressure and temperature are so great at a depth of some sixty miles that the rock will flow

and therefore each section of crust sinks to its proper level and remains in perpetual balance with all the rest of it.

This is known as the "isostasy" theory and has been chiefly worked out by Hayford and Bowie of the U. S. Coast and Geodetic Survey. According to Bowie mountains are not formed by crumbling but by swelling. As the mountains are worn away through erosion by wind and water, the sediment carried down by the rivers is deposited on the edge of the sea. This transfer of material from the mountains to the sea above ground is compensated underground by the slipping of an equivalent amount of the hot viscous material to the base of the mountain so that the mass of the mountain area and of the ocean area remain the same. Mountains may therefore be pushed up from below as they are being rubbed off on top. But not at the same rate for the material forced into the crust from below a mountain area is denser than that eroded from the surface, hence the mountain area will be gradually worn down to a low elevation. So the material of the rocky crust of the earth contracts and expands, rises and falls, erodes and deposits. We find ocean fossils on top of the mountains and some parts of a continent may have submerged and emerged repeatedly in the course of time. Where the mountains are old and worn down and the land has been leveled, there is little likelihood of earthquakes for the crust has practically reached equilibrium. But where the mountains are young and rise sharply from the sea there are still adjustments to be made and these cause slips and jerks comparatively slight in amount but sufficient to bring disaster upon the puny works of man.

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GEOGRAPHY MOLDED EVOLUTION CALIFORNIA SCIENTIST SAYS

Attributing the existence of different species of animals to the influence of different environments, Prof. Joseph Grinnell, director of the Museum of Vertebrate Zoology of the University of California, in an address to the American Association for the Advancement of Science at Los Angeles urged study of the geographical distribution of animals as necessary to an understanding of the causes and methods of evolution.

Pointing out that in California there are more different species of animals than in any other state of the Union except Texas, he explained this as being due to the great diversity of climatic conditions found there.

"Observations of species in the wild convinces me", he said, "that the existence and persistence of species is vitally bound up with environment. Evolution of environment came first - comes first; it is going on continually and in a fashion significantly parallel to the gradual modification of the

animals themselves. The course of organic evolution has been molded and is being molded by environmental circumstance."

Climatological and geological changes, he explained, create deserts and other barriers which serve to isolate stocks under peculiar and different sets of conditions. Natural selection then leads to differentiation of stocks and determines which stocks shall survive.

The course of history of all types of animals living today, he said, has been accompanied by trial and discard of species, subspecies, genera, families, and even orders. Where one has persisted 1000 have become extinct.

READING REFERENCE - Conklin, E. G. Heredity and Environment. Princeton, Princeton University Press, 1922.

Semple, Ellen Churchill. Influences of Geographic Environment. New York, Henry Holt and Company, 1911.

Darwin, Charles. The Origin of Species. New York, D. Appleton and Company, 1889.

KING SALMON RETURNS HOME AFTER LIFE SPENT IN SCHOOL

King Salmon come back to spawn in the same tributary stream from which they started toward the sea. Evidence furnished by 25,000 of these fish introduced into Klamath River by the Fish and Game Commission of California indicate this fact, Prof. John O. Snyder, zoologist of Stanford University told the American Association for the Advancement of Science. They also range much farther at sea than was supposed, and keep together in one large school during their entire life in the ocean, he said.

Just before 250,000 one year old king salmon, reared at Fall Creek hatchery near Hornbrook, were turned loose in the Klamath river, 25,000 were marked by removing two of their fins. Two years later, 23 of the marked fish appeared in the river near the place where they had been released, and the following year 23 more of them were taken in localities ranging from Monterey Bay to the same place in Klamath River reached by those of the previous year.

The scales of these fish, Prof. Snyder said, were of such a peculiar structure as to make possible the identification of these among other fish, regardless of the mutilated fins.

Farmers in practically any section of the United States can now receive by radio reports of agricultural prices and movements at the leading market centers the same day and in many cases a few hours after the news develops.

PLANTS STOP SWEATING TO SAVE SELVES IN DROUGHT

That plants neither toil nor spin has long been known on high authority, but the Ecological Society of America learned from G. A. Pearson, director of the Fort Valley Forest Experiment Station, Flagstaff, Ariz., that in periods of water scarcity the trees native to the Southwest have the remarkable power of reducing the "sweat of their brow" to almost nothing.

"Plants transpire or give off moisture through the leaves in much the same manner as we perspire", he told his fellow scientists. "The rate of transpiration has an important bearing on the ability of plants to grow in a dry climate. If water escapes faster than it is replaced by the roots the plant wilts, and, if this unfavorable balance continues long, death ensues."

In many sections of the country, and particularly in the Southwest, the forests restock with difficulty because young seedlings are often unable to withstand protracted periods of drought. At the Fort Valley Forest Experiment Station we have carefully studied the rate of transpiration of coniferous tree seedlings. All of the native species have shown a remarkable capacity for adjustment in time of famine. When the water supply in the soil nears exhaustion, the seedlings reduce transpiration to almost nothing, and they may continue to live in this condition for several months."

PLANT'S NEED FOR AIR INCREASED BY HOT WAVE

Great lack of oxygen limits the rate of growth of roots at any temperature, but especially at high temperatures, experiments carried on in the Department of Botanical Research of the Carnegie Institution indicate, Dr. W. A. Cannon, staff member of that organization told the Botanical Society of America. This discovery, he said, has an important bearing on various problems associated with the distribution of plants and also on activities of economic plants.

READING REFERENCE - Ganong, W. F. The Living Plant. American Nature Series. New York, Henry Holt and Company, 1913.

RHEUMATISM CHIEF CAUSE OF ORGANIC HEART DISEASE

Rheumatism is the principal cause of chronic heart disease, Dr. C. V. Craster of Newark, N.J., told members of the American Public Health Association at their recent convention in Boston. He said organic heart disease was a serious menace to America, causing about one seventh of all deaths. It is on the increase and has already superseded tuberculosis as the principal cause of death.

Dr. Craster advocated more adequate hospital treatment for rheumatic patients, and popular education as to the danger of heart disease following rheumatism, tonsilitis, and chorea during childhood.

The highest death rates from organic heart disease are to be found in the States of Vermont, New Hampshire, and Massachusetts, while the lowest reported rates are from Montana, Mississippi, and Tennessee.

HOW TO HEAT YOUR HOME

II Putting The Heat Where Needed

By Samuel S. Wyer,
Associate in Mineral Technology,
U.S. Smithsonian Institution.

Keeping the house temperature lower is the easiest way to save fuel. It is fuel saved by doing less work.

Most houses are kept too warm. About 25 per cent of the house fuel is used in raising the room temperature from 60 to 70 degrees. Houses can be kept five to ten degrees lower than is customary, - that is, kept at 62 to 68 degrees, - without any discomfort or any danger to health.

In most houses, especially when hot-air furnaces are used, the room air is too dry for health and comfort. That is the "moisture-content" or humidity is too low. With proper humidity of air, not less than 30 per cent lower temperatures may be comfortably maintained and less fuel used.

The humidifying equipment usually available is grossly inadequate. For instance, it would require the evaporation of 1/2 gallon of water an hour to maintain 40 per cent. relative humidity, with the room temperature at 70 degrees Fahrenheit and the outdoor temperature zero if 9,000 cubic feet of air per hour, the proper amount for an average one family house, are used.

Most hot air furnaces take their cold air only from the outside. This is wrong. When the basement is clean, by merely taking the air out of the basement, at least in severe and windy weather, a saving of 20 per cent. to 30 per cent. in the fuel required to heat the house can be made and the house kept more comfortable.

There is nothing novel in this. Hot air furnaces have been installed on this plan for many years, the only surprising feature is that all furnaces are not installed in this way, instead of an occasional one.

The carbon dioxide content in the air of the living room should be kept below 7 parts in 10,000 by ventilation. Each person exhales about 6 tenths cubic feet of carbon dioxide per hour and about 1,800 cubic feet of fresh air is necessary for each person per hour to dilute the carbon dioxide.

One complete change of air an hour in an occupied room of a home is adequate and the outdoor air leaking in through cracks in floors, walls around windows and doors and through porous walls is not objectionable. However, during high winds there may be as many as five changes of room air each hour.

This not only wastes fuel but may make adequate heating impossible.

Prevention of unnecessary cold air leakage into the house not only saves heat, and, therefore, fuel, but decreases the dirt blown in. In cold climates, on the side of the prevailing winds, storm sashes are effective. Calking material around window and door frames and weather stripping for doors and windows, when properly put on, are a good means of reducing unnecessary cold air leakage. In many houses the space between the roof and the upper story is so open as to let cold air get in or heat radiate out through the ceiling. Cellars are alwasy desirable since floors where the wind can get underneath are not only uncomfortable but serious heat wasters. In many of the recent houses, especially those "built to sell" the construction is so defective that a reasonably tight room cannot be secured. Fuel savings of 15 to 25 per cent. are easily possible by making the house tight.

Respiratory diseases cause about one-third of all of the deaths in this country. Practically all other forms of bacterially caused diseases have been brought under control in the last fifty years while respiratory diseases have increased. Pneumonia is one-third more frequent in urban than in rural districts. The seasonal cycle of pneumonia, where house heating is necessary., is startling. The highest death rate occurs during the heating seasons. This is believed to be due to lowering of vitality on account of improper heating and ventilation. The toxic action from combustion products, especially carbon monoxide, from flueless gas heating stoves is undoubtedly also important.

Most hot-air furnaces have a sluggish hot-air draft, depending on the wind, on some days or to some rooms of the house. Placing an electric motor fan in the cold-air intake will make the draft positive and independent of atmospheric conditions. A fan will increase the volume of air going through the furnace and deliver more heat but at lower register temperature, that is, deliver "warm" instead of "hot" air. This will result in better living conditions in the room; and the utilization of more heat from the fuel, thus decreasing the fuel consumption.

III How To Use Anthracite

The public has been erroneously taught to believe that only so-called "domestic sizes" of anthracite could be used in the home. The small "steam sizes" represent 29 per cent of the total anthracite mined. As the public, through lack of understanding of the facts, has been unwilling to use these they become mere by-products and are sold below cost of production at whatever they will bring and are used in competition with bituminous coal without regard to their intrinsic value. For instance, when the f.o.b. mine price on "stove size" was $8.10 the "steam size" brought as low as $1.50 per ton. The loss on the "steam sizes" must be made upon the "domestic sizes." Yet with proper utilization methods these steam sizes can be successfully used in the home.

Trade customs and improper utilization methods have resulted in an unnecessary number of sizes. These all add to the ultimate cost. From the public's viewpoint it would be desirable to arrange for an immediate reclassification and the adaptation of domestic appliances to the use of the smaller sizes, that,

under existing market conditions, are sold in competition with bituminous coal.

To burn any small anthracite, it is necessary to provide forced draft at the rate of about 235 cubic feet of air per pound of coal burned. The size of motor required rarely exceeds one sixth horsepower and requires about eight killowatt hours of electric energy per net ton of coal burned.

A cast iron plate, with about ten per cent. of its area in holes, about one half inch in diameter is laid on top of the old grate and cemented tight around the edges of the furnace so that all the draft must pass through the holes.

Fires are cleaned entirely by hooking clinkers out of the firing door. Only a very small amount of dust finds its way through the small holes in the plate into the ash pit, and it is rarely necessary to clean an ash pit more than twice during the entire heating season. The stack damper must be entirely removed or fastened in its open position to prevent closing. In firing and in banking, it is very important that at least one bright spot be left uncovered in order that the gases, as they are driven off the fuel bed will be ignited. In banking the fire, it is only necessary to stop the blower. The system lends itself well to thermostat regulation, the thermostat being employed to stop and start the motor instead of opening and closing the dampers.

Follow the following rules in burning the ordinary domestic sizes of anthracite:

1. Carry a deep fuel bed, 5 to 10 inches thick, so that it will not burn through in spots and admit large excess of air.

2. Shake the grate to remove ashes, but stop before live coals appear in the ashes.

3. Fresh fuel should be spread evenly over the entire grate area.

4. Be sure to leave one visible bright spot of live coal to ignite the gases coming off the freshly fired fuel. In this way the gases from the coal will be burned gradually and will not accumulate in the fire pot and burn with an explosion.

5. After firing, keep the dampers wide open until blue flames appears, then check off the draft as much as necessary to keep fire burning at desired rate.

When burning coke with pea or buckwheat anthracite follow rule 5 above and:

1. Spread a thin layer of anthracite over the entire grate and allow a few minutes for this fuel to ignite. Next fill the fire pot with coke and allow this to burn until blue flame appears, then add another layer of anthracite.

2. When banking the fire use less coke and more antracite but otherwise fire in the same manner.

HAWAII HAS HOLD-UP BIRD

How feathered pirates of Uncle Sam's Pacific islands chase other sea-birds and force them to give up their food valuables, was shown by Dr. Alexander Wetmore of the U. S. Biological Survey, in an illustrated talk on the life of the Hawaiian Bird Reservation made before the American Ornithologists' Union at Cambridge, Mass. Dr. Wetmore recently returned from the exploration of the islands which form the Reservation and dot the ocean for 2,000 miles westward from Honolulu.

Among the pictures showing the strange habits of many of the queer birds with which these islands abound were some of the frigate bird. This bird, Dr. Wetmore said, lives as a parasite on boobies, terns, and shearwaters. When one of these birds secure sea food, the frigate bird gives chase. If the food is not surrendered readily, the frigate bird seizes the tail of his victim and swings him violently until he disgorges the precious morsel.

At Necker Island, Dr. Wetmore said he found a tern different in appearance and habit from all known species of terns. This sea-bird has longer legs than other species and frequently flies along with its feet pattering along the surface of the water as does the petrel.

On Laysan island, fine pictures of the dance of the albatross were taken. These birds, as big as geese, dance a sort of fox-trot he said. The dancing is done in pairs and is a social custom which is intensely interesting.

The birds were not at all frightened by the photographers, and fine pictures were readily secured.

MOTION PICTURES REVEAL NEW FACTS ABOUT BIRDS

Motion pictures were credited with being the most important factor in the advancement of modern bird study, by Dr. T. S. Palmer, seccetary of the American Ornithologists' Union, in a review of the development of that association at its fortieth annual convention held in Cambridge, Mass. recently.

"Seldom is a motion picture shown at one of our meetings that some hitherto unknown habit of the birds is not revealed," he said.

In the meeting here this year, pictures taken by expeditions in distant and little visited parts of the world with slow motion cameras, make possible the analysis of strange bird habits about which naturalists have wondered for years, he pointed out.

First illustrations shown at one of the early conventions were still pictures of stuffed birds, Dr. Palmer said. Finally photographs of birds actually taken in the wild state were introduced, but one or two plates were then considered a good season's work.

BIRD BANDING THROWS LIGHT ON DUCK MIGRATION

Interesting facts in regard to the migration of mallard ducks were told by Frederick C. Lincoln of the U. S. Biological Survey in an address before the American Ornithologists' Union in convention at Cambridge, Mass. By means of pictures and maps, Mr. Lincoln showed the methods used and the results obtained in banding 4,000 mallard ducks for identification.

The center of the great breeding range of the mallard duck is in lower Saskatchewan, Canada, while the center of its winter range is along the lower Mississippi from the mouth of the Ohio to the Gulf. Among the birds marked by Mr. Lincoln in Illinois were some which later turned up in Texas a few miles west of Houston. The route apparently taken by these birds converged at that point with the route taken by ducks formerly banded at Salt Lake City. As the western birds are from flocks which have a different range and breeding ground, it remains to be discovered by later returns whether the Mississippi mallards, whose winter range mingles with that of the western birds, join the western flocks and fly north with them in the spring or whether their homing instinct is unerring and they return to Canada by the Mississippi valley route.

One duck caught at the mouth of the Mississippi some years ago was shipped to New York, banded there and released, and was killed in Saskatchewan, Canada, two years later. Apparently in this case, said Mr. Lincoln, the homing instinct had directed the bird back to his home breeding ground and from there he had twice been back and forth on the old Mississippi route before he was shot.

Some of the ducks banded in Illinois have been found in the South Atlantic states and whether they flew across the mountains or took a more circuitous route is yet to be determined by additional returns from the banding experiments.

COLDS PROVED INFECTIOUS BUT GERM ELUDES DOCTORS

Proof that common colds are infectious and probably due to a germ so small that it cannot be seen through the most powerful microscope was presented by Dr. Peter K. Olitsky of the Rockefeller Institute of New York to the American Public Health Association meeting in Boston recently. Human beings were used in the laboratory experiments.

The experimental work in which he and Dr. J. E. McCartney were associated was done, Dr. Olitsky said, over a period of four years. The many experiments were made on human volunteers because animals were unsuitable for the purpose. The slight symptoms of a common cold are hard to detect in rabbits. Subjects were infected with the filtered washings from the nasal membranes of a sufferer from a cold. They promptly developed colds themselves which were transmissable in like manner to other volunteers. Dr. Olitsky said that this indicated that a germ was the causative agent and that it was so small that it passed through the pores of an earthenware filter.

The germ remained invisible although cultures were prepared from the nasal secretions of 40 patients with colds. This indicates either that the germ is too small to be seen through the most powerful microscopes or that the methods

used were unsuitable for its food requirements, Dr. Olitsky said. Experiments on rabbits had determined that the common cold is wholly distinct from epidemic influenza.

Dr. Olitsky has previously discovered the germ that is supposed to be responsible for influenza and early this year he tried a vaccine prepared from the influenza, using a group of Washington volunteers as subjects.

DIPHTHERIA IMMUNIZATION FOR CHILDREN URGED BY DOCTOR

Diphtheria among school children could be largely eliminated through preventive immunization of children of pre-school age who have been shown by the Schick test to be susceptible to that disease, said Dr. Frederick W. Sears, N.Y. State Health Officer for Syracuse and near-by counties, in an address before the American Public Health Association at Boston.

This might be brought about through proper co-operation between parents and physicians, the bringing before them by the proper authorities of the great value and benefit of the Schick test and the immunization of children shown to be susceptible to diphtheria infection. Testing the children and subsequent immunization was a task better performed by private physicians than by the stat Dr. Sears said.

TABLOID BOOK REVIEW

BIRTH CONTROL by Dr. Lydia Allen De Vilbiss, with a foreword by Dr. Adolf Meyer of Johns Hopkins. Boston. Small Maynard & Co. $1.75

A temperate argument for birth control from the standpoint of the physician and social worker. "Either the American race must check the appalling increase of mental deficients and defectives or be engulfed by them; either America must control this stream of defective protoplasm or go down with it."

Engineers are studying a number of projects for hydro electric development in Asiatic Turkey.

Recent discoveries at Cirencester, England, indicate that the ancient city wall hitherto believed to have been constructed by the Romans was built by pre-Roman tribes.

The cocklebur, troublesome as a weed because of its stiffly armed burs, has been definitely demonstrated to be poisonous to livestock in the early stages of its growth.
