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RADIOACTIVITY AND THE FORMATION OF PLEOCHROIC HALOES

IN a chip chiseled from the front doorstep of his college, in the sands of Nova Scotia's famed bathing beaches and in specimens of biotite mica from the Orient, Dr. George H. Henderson, of King's College, Dalhousie University, Halifax, has found evidence of what may prove to be unknown chemical elements no longer existent on the earth's surface.

In an interview at the meeting of the Royal Society of Canada, meeting at Hamilton, Ontario, Dr. Henderson said he had recently discovered at least three new types of pleochroic haloes which have so far been inexplainable as due to already known elements. The time required for their formation, possibly only a few hours or days, although perhaps as great as one hundred years, is much too short to be compatible with geological evidence.

"A pleochroic halo, one of the most striking manifestations of radioactivity," Dr. Henderson said, "might be compared to a photographic negative. It is caused by alpha rays emitted by members of the uranium family of elements as each disintegrates to form the next in the atomic scale. The rays emitted during this disintegration of the uranium crystal act upon mica and certain other minerals in a similar manner to that in which light affects the silver salts of a photographic film."

A dark spot is produced in the mica around the uranium particle. This is surrounded by a series of six concentric dark rings, whose diameter is measured with a halo photometer designed by Dr. Henderson, which allows more accurate determinations than are possible with a microscope.

"The sizes of these halo rings made millions of years ago corresponded exactly with recent laboratory observations on radioactive elements," Dr. Henderson said. "This proves conclusively that the laws of physics as we know them to-day held good even at the time of formation of the earth's crust. The largest outer ring is no greater in size than a human hair in diameter."

As these haloes disappear at temperatures around 900 degrees Fahrenheit, Dr. Henderson infers that the Precambrian rocks from which much of the mica was obtained can not have reached that degree of heat since they were formed.

CONTINENTAL DRIFT

NEW measurements fail to indicate that the continents of the earth are drifting apart as the much-discussed theory of Professor Alfred Wegener suggested many years ago. The theory pictured North and South America as originally linked with Europe and Africa with the various peninsulas and gulfs and bays fitting like a jig-saw puzzle. Then, over the long periods of geological time, the continents drifted to their present situations.

C. C. Smith, of the staff of Dominion Observatory, Ottawa, reported to the meeting of the Royal Society of Canada the observations which fail to check the Wegener hypothesis of continental drift.

In 1926 the International Astronomical Union began to check up on the theory. Accurate longitude determinations of key cities in North America and in Europe were then made. Periodically their positions have been redetermined. Star observations, clocks and wireless time signals made these determinations possible.

The distance between Ottawa and Vancouver, Canada, apparently has shrunk some nineteen feet in the last nine years, while between San Diego and Washington the American continent has apparently expanded nearly 40 feet. The differences are, however, just at the borderline of the accuracy of the observations. Mr. Smith reported that the American continent shows on the average an easterly drift toward Europe which is the opposite of the Wegener predictions and that these anomalies "are to be expected from the proportion of the quantity measured to the probable error and probably several decades will have to elapse before the Wegener theory can be finally tested by longitude measurements of this character."

THE AMPLIFICATION OF HEART SOUNDS

AN electrical stethoscope which enables a hundred doctors and medical students to listen to heart and lung sounds was described before the Royal Society of Canada by Dr. K. A. Evelyn, of the university clinic, Royal Victoria Hospital, Montreal.

With a powerful microphone and loudspeaker amplifying system attached to the ordinary stethoscope, physicians—and physicians-to-be—can quickly learn the characteristic sounds for various heart ailments. Moreover, a system, like the tone control on a radio set, enables the doctors to separate the various sounds of the heart beat into the low- and high-pitch components. This is a new aid for diagnosis.

The secret of success of the new stethoscope is the sound-proof box in which the microphone is placed. This cuts out all extraneous noises which might mask, when amplified, the delicate sounds of the heart beat. Once the heart beat is turned into electrical impulses it is easily possible to pass them through a cathode ray oscillograph and obtain a continuous picture which can either be obtained visually or photographed on a motion picture film for permanent record.

The idea of using amplifying systems to allow many people to study heart beats is not, in itself, new. Drs. C. J. Gamble and D. R. Replogle, of Philadelphia, reported a similar device to the American Medical Association in 1924. But with the advance of radio and electrical science in the last eleven years techniques formerly not available are now possible. Especially is this true for the tone control, or frequency sorter, which Mr. Evelyn's device employs.

PROGRESS IN THE STUDY OF CANCER

FEVER treatment combined with small repeated x-ray doses gave better results in treatment of a certain type of cancer in rabbits than either method alone, Dr. Staf-

ford L. Warren, with John J. Jares and Otto Sahler, of Strong Memorial Hospital, Rochester, N. Y., has found in preliminary tests of this method of attack on cancer. This study was announced in the report of the International Cancer Research Foundation of Philadelphia which is supporting Dr. Warren's research. Application of this work to human cancers is far in the future, if it proves possible. So far only one type of cancer has been investigated and only small numbers of animals have been used.

Three years ago, working with funds from the Rockefeller Foundation, Dr. Warren found that high fever temperatures would kill cancer cells outside the body within a definite period of time. He found that high temperature also destroys cancer cells in the body, but only in one fifth of the cases. Small repeated doses of x-rays, called fractional doses, destroyed the cancers in nearly half (42 per cent.) of the cases. When the fever treatment was combined with the fractional doses of x-rays, the percentage of apparent cures was doubled (84 per cent. of the cases).

Other researches include the following: For the first time human cancers can be kept alive and growing for long periods of time outside the body. Dr. George O. Gey, of the Johns Hopkins Medical School, reported his new method which should aid greatly efforts to find better ways of destroying cancers. The mystery of why cells become malignant may be nearer solution.

Another cancer-producing substance has been prepared from coal tar by Professor J. W. Cook and associates at the London Free Cancer Hospital. Professor Cook's latest discovery shows the importance of a certain kind of chemical architecture in cancer-producing substances from coal tar. A combination of carbon and hydrogen known to chemists as the methyl group—the same methyl group that is in deadly methyl alcohol or wood alcohol—occurs twice in the new cancer-producing compound. Apparently more important than the methyl group itself, in connection with the cancer-causing property of the new substance, is the place where it is attached to the substructure of the new substance as its molecule is built up. Even a single methyl group at "position 5" causes marked cancer-producing activity.

Calories also have an important relation to cancer. Studies on this phase of the problem have been made by Dr. Fritz Bischoff and coworkers of the Santa Barbara, Calif., Cottage Hospital. Growth of cancers in mice is notably affected by reducing by half the amount of calories in the diet of the mice. Weight loss in itself is not a clear indication of the nutritional state, as other factors enter in. Consequently, emphasis is laid on the importance of determining caloric intake.

ETHYLENE GAS IN HORTICULTURE

ETHYLENE gas, widely used to blanch celery, bring the glow of ripe color to the skins of fruit, and otherwise hasten the maturing of garden products, is actually generated by plants in the natural process of maturing for the market. Such are the indications of researches conducted at the Minnesota Agricultural Experiment Station by R. C. Nelson and R. B. Harvey, and independently at the Low Temperature Research Station at the University of Cambridge.

In their experiments, Nelson and Harvey used young tomato plants as "indicators" for the gas. The response of a tomato plant to ethylene is characteristic. It arches its leaves downward. These "indicator" tomato plants were put into closed glass vessels. Into similar vessels quantities of a self-blanching variety of celery were introduced. After two hours, the gases from the celery vessels were drawn into the glass prisons of the tomato plants. The leaf-stems of the latter curved downward strongly, showing that a compound with the physiological effects of ethylene was produced by the celery. In a parallel test, using a non-blanching celery variety, the tomato plants did not respond: no ethylene was being produced. Similar results were obtained in the Cambridge University experiments, in which the ethylene gas was produced by ripening apples.

Nelson and Harvey call attention to a practical significance of this discovery. When ethylene, best known as a constituent of illuminating gas, first began to be widely used for the treatment of fruits and vegetables, the question was raised whether it might not possibly have harmful effects. Now, they state, "Since it has been shown to be produced by blanching celery under natural conditions, any fear of artificially using this gas should be removed from the minds of the public."

THE FUTURE FLYING MACHINE

LARGE tailless airplanes propelled by engines within the wings and fueled by economical heavy oil are visualized as the result of research achievements of engineers of the laboratories of the National Advisory Committee for Aeronautics.

Tails on airplanes are likely to disappear because Uncle Sam's experts have found that wasteful air resistance created at the joining of wing with fuselage can be eliminated by using tapered wings and devices to replace the tail.

Cooling air blown over engines housed within the wings promise to make possible speedier and more economical flying. And engines that ignite heavy oil fuel by compression instead of gasoline by sparks from plugs promise to give more air miles on less fuel, increasing the pay load in passengers and freight carried.

Aeronautical experts receive these latest reports with confidence because fresh in their experience are marked increases in speed of airplanes without added cost achieved through NACA researches. The famous cowling for aircooled engines and new locations for engines in relation to wings actually increased multi-engined airplane speeds from a normal 125 miles per hour to 200 miles per hour without a single horsepower increase in engine power. The reward was faster air transport schedules and much saving in time and money.

Other new NACA results of the past year include: A simple fixed landing gear that is as efficient as present landing apparatus that must be retracted during flight. New researches on the vertical ascent of autogyros, which is accomplished by storing energy in the rotor wings and then using it for the ascent by

suddenly increasing the rotor pitch. Flaps on airplane wings that reduce the landing distance to about half and the take-off distance by about a quarter.

PATENTED PLANTS

PATENTED flowers, fruits and other plants have not accumulated very fast since the plant patent law went into effect five years ago, on May 23, 1930. Files of the U. S. Patent Office show only 124 plant patents of all kinds, contrasted with the thousands of patents on mechanical devices and processes that pour from inventor's brains every year.

Four classes have thus far proved sufficient for the arrangement of plant patent records: roses, other flowers, fruits and "plants"—the latter category being a catch-all for everything that is not classifiable as either flower or fruit.

Aside from roses, patented flowers have run rather strongly to carnations, dahlias, chrysanthemums and freesias. Among patented fruits, apples, plums, cherries, grapes and avocados are conspicuous. Patented vegetables are conspicuous by their absence, but there is one patented mushroom.

The highest number of plant patents granted to a single applicant is nine, to the estate of the late Luther Burbank. The Burbank patents include two roses, five plums, one peach and one cherry. There are at present, however, several commercial nursery companies that hold numerous plant patents, sold or assigned to them by the inventors. A number of patents have been granted to breeders in England, Holland, Czechoslovakia and other foreign countries; most of these have been assigned to American firms.

To be patentable, a plant must be capable of "asexual" propagation, that is, it must be reproduced from cuttings, bulbs, grafts or by any means other than seed. From the provisions of the law, however, tuber-propagated plants like potatoes are excluded.

When an application for a plant patent is received it is not only examined by officers of the U. S. Patent Office, but is submtted also to the Bureau of Plant Industry of the U. S. Department of Agriculture, which has a corps of botanists and horticulturists capable of judging whether the variety is really new and distinct, and also of certifying whether or not its method of propagation makes it eligible to patent rights under the law.

ITEMS

How man is exceeding nature in the artificial production of piercing gamma rays like those given off by radium and used in cancer treatment, is pointed out in the latest report from the California Institute of Technology. Nearly two and a half times more piercing than the natural gamma rays is the radiation liberated from the light element beryllium when it is bombarded with protons, the nuclei of hydrogen atoms, according to the report of Professor C. C. Lauritsen and Drs. H. R. Crane, L. A. Delsasso and W. A. Fowler to *The Physical Review*. Champion of natural gamma rays for piercing power are those from thorium C″ having energies equivalent to 2,600,000 electron volts. Professor Lauritsen's beryllium rays have energies equal to 6,000,000 electron volts. Record energies for artificially man-made gamma rays are those which Professor Lauritsen obtained by bombardinug lithium with protons. These gamma rays had energies equal to 16,000,000 electron volts.

A LOUD high-pitched sound produces more ear strain and a greater loss of hearing if it is interrupted every second instead of being continuous, Dr. Elmer Culler and Glen Finch reported to the Midwestern Psychological Association meeting at Lawrence, Kans. Thus the well-known engineering rule that oscillating stresses are more destructive than a dead load of the same magnitude is found to hold for the cochlea of the ear just as it does for a bridge. Long exposure to a note of 1,000 cycles frequency, which is near the upper limit reached by the soprano voice, will be followed by a loss of hearing for notes of all frequencies down even lower than middle C at 256 vibrations a second. When a sound at the upper limit of the musical scale, 4,000 cycles in frequency, was continued over ten hours, the loss of hearing increased from a 55 decibel loss for sounds at 125 cycles to 104 decibels at 4,000 cycles. A noise of 55 decibels corresponds to the sounds of an average city street, while a 104 decibel sound is equivalent to the noise in a boiler shop.

MAPPING all the variations of natural radioactivity over the earth is a project put forward by Dr. V. I. Vernadsky, of the U. S. S. R. Academy of Sciences. Intensity of radioactive activity in each locality would be indicated on the map as a vertical projection, making possible the tracing of "isoradioactive" lines. Such a map would have a two-fold importance. For the benefit of "pure" science, it would help to bring out more clearly the distribution of crustal rocks in order of their geologic age, for the ages of rocks are indicated in part by their degree of radioactivity. On the applied science side, it might help locate new helium wells, since helium is everywhere a natural product of radioactive decomposition of the rocks, though in only one or two places known at present have conditions been such as to bring about its accumulation in economically paying quantities.

BRAZILIAN cotton has been severely damaged by the season of heavy untimely rains, according to information received by the Bureau of Agricultural Economics of the U. S. Department of Agriculture. Brazil's chief cotton lands, where the great cotton boom of the past two years has been going on, lie some hundreds of miles to the southwest of stricken Bahai, principally in the state of São Paulo, but the rains have been going on steadily there during what is normally the dry cotton-picking season. The damage has been two-fold: first, direct deterioration in the quality and size of the crop; second, continued growth of both cotton plants and weeds. The lack of cool weather in the Brazilian autumn (which coincides with our spring) is a standing source of difficulty in the Brazilian cotton-growing area, since the unchecked growth of the plants furnishes ideal conditions for the attacks of bollworm and other insect pests.