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THE SUN'S CORONA DURING AN ECLIPSE

THE shape of the sun's corona, which is the aureole of pearly light visible only during a total eclipse, is closely related to the number of sun-spots, but runs ahead of them by about two years.

This, in rough brief outline, is one of the results of observations on the "Tin Can Island" eclipse in 1930, which has been worked out by Professor S. A. Mitchell, director of the Leander McCormick Observatory of the University of Virginia, who reported his researches before the annual meeting in Philadelphia of the American Philosophical Society.

The coronal shape seen at eclipses when sun-spots are at their lowest number characteristically shows two long wings streaming out on either side of the sun along the equatorial region with shorter brushes projecting from its polar regions. The startling thing about the 1930 corona was that it showed this shape in spite of the fact that the next minimum in sun-spot numbers is not expected until 1934. This was all the more surprising for the reason that the corona at the preceding year's eclipse had shown the shape characteristic of sun-spot maximum.

The most interesting result of Professor Mitchell's 1930 observations, however, was further evidence concerning the existence of the element "coronium" on the sun. Analysis of light from the corona by means of the spectrograph has shown numbers of bright lines. Some forty lines, however, were at first unidentifiable, and were supposed to be due to an unknown element which was given the provisional name "coronium," just as helium was similarly identified by the spectroscope on the sun before it was known on earth.

However, it has now been shown that 22 of the 40 lines are caused by high-level lines in the sun's atmosphere called the chromosphere and hence can be traced to elements known on earth. The origin of the remaining 18 lines provisionally ascribed to "coronium" still remains one of the astronomical mysteries.

The eclipse expedition of 1930 was known as the "Tin Can Island" expedition because that is the nickname for Niuafoou Island, the only available land in the wide Pacific Ocean where the eclipse was total. The island received the name because the only method whereby its mail is delivered from passing steamers is by its being sealed in a big tin can which swimmers from the island bring ashore.

INVESTIGATION OF COSMIC RAYS AT THE FRANKLIN INSTITUTE

STUDIES of the mysterious cosmic rays that continually bombard the earth from outer space, in order to determine the direction from which they come, to detect individual rays and to measure their energy, were described on April 20 to members of The Franklin Institute by Dr. W. F. G. Swann. Dr. Swann gave his annual report on the work of the Institute's Bartol Research Foundation, of which he is director.

He told of the cosmic ray "telescope" which he has recently developed. This device consists of two steel spheres at the end of a steel support. A large cylinder of lead is between the spheres, which contain gas. When the cosmic rays enter the spheres, the gas is "ionized," and it becomes a conductor of electricity. If the rays hit the telescope on the side, the two spheres receive an equal amount of the radiation. The adjustments are so made that the effect is that one sphere will just neutralize that in the other. But if the rays come in line with the telescope, the lead cylinder shields the sphere farthest from the source of the radiation, and the effect is less at that end.

Dr. Swann also told of an improvement in the "Geiger counter," a device for detecting cosmic rays, that has been made by his colleagues, Drs. Thomas H. Johnson and J. C. Street. This apparatus, as used in the past, consists of a metal cylinder, in the center of which is a wire, and which is itself enclosed in a glass tube filled with gas. Between the wire and the cylinder is maintained an electrical potential of 1,500 volts. Though the gas acts as an insulator, and the current can not flow from the wire to the cylinder, a single cosmic ray is enough to break down its insulating properties. Then the electricity passes through, and the discharge may be recorded. Because the gas must be just on the point of breaking down, and passing the current, the counter is apt to go off accidentally, without a cosmic ray being present. Also, after the counter has once operated, it takes a short time for the apparatus to recover, and to be ready for the next ray, so that some may be missed, if they come too rapidly.

Drs. Johnson and Street, the speaker explained, have produced counters which recover ten times as rapidly as those formerly used, and which are practically free from disturbances caused by the electrical discharges when they are operated. Dr. Swann said that the same counting rate has been obtained day after day, and that this indicates the reliability of the device. He said that their rate is such that one ray will pass through every square centimeter on the average of once every 137 seconds.

Other experiments at the laboratory have to do with the killing effects of x-rays. Cells of *Euglena*, a microscopic plant, were used in experiments by Dr. Swann and Dr. del Rosario. It has been thought that the killing effects were dependent on the absorption of the rays, and that if more were absorbed the killing would be more complete. But they find that some of the rays are more deadly than they should be. This, they suggest, is due to a sensitive entity in the cell, and they have determined its size, if it really does exist.

Still other experiments, by Dr. C. T. Bainbridge, have had to do with isotopes. At one time it was supposed that the atoms of a single chemical element were all of a single weight. However, it was found some time ago that various elements consist of isotopes, which have

atoms of different weights though they are the same element. Dr. Bainbridge has discovered three new isotopes of the element tellurium. He has also determined those in zinc, and has shown that some effects previously supposed due to zinc isotopes were really the result of hydrogen as an impurity.

THE DELPORTE OBJECT

A SMALL point of light in the heavens is pronounced by Dr. Fred L. Whipple, of the Harvard College Observatory, to be "the most interesting and puzzling body of the solar system since the discovery of Pluto." It is the Delporte object discovered by Professor E. Delporte, the Belgian astronomer, on March 9.

It has kept the astronomers of the world guessing as to whether it is a comet or an asteroid. Dr. Whipple and L. E. Cunningham, after computations of two sets of elements to determine its path in the heavens, are of the opinion that it is a comet and possibly identical with Comets 1858 III and 1907 III. Further computations of the influence of the earth upon the object must be made to determine whether the Delporte object is actually this older comet on a return to the vicinity of the earth.

"The very rapid motion, 2.5 degrees per day, and faintness indicated a very close approach of a small object naturally suspected of being an asteroid because of its stellar appearance," said Dr. Whipple. "Its orbital elements were very difficult to determine accurately even from an apparent arc of fifteen degrees because its motion was nearly in a great circle. No comet or asteroid can move in this fashion for any length of time, but the peculiar coincidence of position in the sky and plane of orbital motion enabled the Delporte object to move fifteen degrees in a great circle with a deviation of only a minute of arc for about six days.

"The orbital elements when more accurately determined were on the border-line between asteroid and comet, appearing, however, more asteroidal than cometary. The eccentricity of 0.5 and period of approximately three years are distinctly those of an asteroid although the orbit plane and perihelion distance are very similar to those of the comets of 1907 III and 1858 III. A period of about three years as computed by Cunningham and myself would indicate that the body, without being observed, had passed perihelion seven times between 1907 and 1932, in case it is identical with 1907 III. This seems perfectly possible because at its opposition the body was rather faint (magnitude 13) when observed at a distance of only 0.92 astronomical units. The distance from the earth would have been much greater at other perihelion passages. It seems less probable but still possible that the object was not observed between 1858 and 1907, in spite of the greater brightness in past years, this possibility being due to the rapidity of its motion at opposition.

Professor Van Biesbroeck, of the Yerkes Observatory, states that on April 5 the object had decreased in brightness to the fifteenth magnitude from the thirteenth magnitude late in March. This behavior is characteristic of a comet and not of an asteroid.

LEAVES OF PLANTS ARE BEST GAS DETECTIVES

POTTED tomato plants can give warning of gas leaks, long before even that most sensitive of animal detectives, the canary, could detect them. This is one of the possible uses for the peculiar behavior of plants in the presence of ethylene gas that was suggested by Dr. William Crocker, of the Boyce Thompson Institute for Plant Research, speaking at one of the closing sessions of the American Philosophical Society's meeting in Philadelphia. Plants could also be used to detect dangerous gases in garages and other closed spaces where men are at work.

The value of many plants, and especially the tomato plant, for this purpose depends on the curious behavior of their petioles or leaf-stems in the presence of very dilute quantities of ethylene gas, which is a common ingredient of illuminating gas and is also almost invariably present when the poisonous carbon monoxide is being generated. Dilutions of ethylene as low as one part in ten million of air will cause tomato leaf-stems to begin growing on the upper side where they did not grow before, thus causing them to bend downward instead of up. This effect was first demonstrated several years ago by Sarah L. Doubt, and has since been the subject of much research by Dr. Crocker and other plant physiologists.

Curiously enough, if a potted plant is turned upside down and then exposed to ethylene, it does not react. It behaves as though it were confused, not knowing which way to turn. The secret of this lies in the fact that the growth direction of the leaves is really a response to the pull of gravity, and the ethylene, by anesthetizing the plant, destroys its ability to respond normally to this stimulus.

Not all plants are sensitive to ethylene, however. Dr. Crocker mentioned the common Boston fern, which remained unaffected by the gas in atmospheres containing 90 per cent. of it. On plants sensitive to its action, ethylene has a whole series of effects, which Dr. Crocker and his associates have studied. Among other effects, it produced a slowing down in the rate of growth in length, it brought about a destruction of chlorophyll in rose leaves, it caused leaves to fall off from many plant species. In smaller concentrations it has been used commercially for a number of years in the artificial ripening of many fruits and vegetables.

DECREASED APPROPRIATIONS FOR THE BUREAU OF STANDARDS

DECREASES in appropriations for the Bureau of Standards are planned and expected to go through as follows: Salaries, $65,000 from $710,000; equipment, $8,000 from $88,000; general expenses, $8,000 from $68,000; improvement and care of grounds, $5,400 from $17,400; testing structural materials, $48,200 from $318,200; testing machines, $6,700 from $51,700; investigation of fire-resisting properties, $7,320 from $32,320; investigation of public utility standards, $11,570 from $101,570; testing miscellaneous materials, $6,160 from $46,160; radio research, $8,000 from $82,280; color standardization,

$3,180 from $15,180; investigation of clay products, $5,160 from $45,160; standardizing mechanical appliances, $8,020 from $48,020; investigation of optical glass, $3,180 from $25,180; investigation of textiles, $7,100 from $57,100; sugar standardization, $7,520 from $82,520; gage standardization, $6,700 from $46,700; testing railroad-track, mine and other scales, $8,060 from $58,060; high-temperature investigations, $4,080 from $10,080; metallurgical research, $6,640 from $56,640; sound investigations, $3,140 from $11,140; industrial research, $132,860 from $232,860; standardization of equipment, $79,525 from $229,525; standard materials, $2,540 from $10,540; investigation of radioactive substances, $9,320 from $29,320; utilization of waste products from the land, $7,900 from $47,900; investigation of automotive engines, $7,760 from $47,760; investigation of dental materials, $4,940 from $9,940; hydraulic laboratory research, $11,000 from $51,000; total cut from the Bureau of Standards, $492,975, making total appropriation $2,137,280 instead of $2,630,255.

Other departments of the government requiring work from the Bureau of Standards may have it done by paying for it and similar provision will probably be made so that commercial firms may pay for work they want done.

THE FOREST SERVICE

OPPOSITION to President Hoover's reported plan to have the U. S. Forest Service transferred from the Department of Agriculture to the Department of the Interior will be voiced editorially in the forthcoming issue of *The Journal of Forestry*. The editorial will say, in part:

"Federal forestry is primarily a conservation measure and it is of great magnitude and most far-reaching effects. The Department of Agriculture, eminently successful in handling problems concerning the conservation of farm lands, has given an equally satisfactory accounting of its handling of forest land matters. By virtue of its policies, experience, tradition and the public spirit of its personnel, it is the most competent of the existing departments to administer the federal forestry work.

"The Department of the Interior is essentially not a conservation agency—never has been and was not created to function as such. It has been concerned principally with land disposal rather than the initiation of its wise use. Such forestry or conservation that it has been or is engaged in, is purely incidental or has been forced upon it.

"To place the Forest Service, charged as it is with the best and most constructive management of forest lands for the public, into a department which is traditionally unsympathetic to such use, is to make it an official stepchild and is too likely to endanger the very purpose for which the national forests were created.

"Unless the administration can offer a better way to reorganize and unify federal forestry work than to put it all in the Department of the Interior, we must insist that the Forest Service be left in the Department of Agriculture."

ITEMS

APPROPRIATIONS by the Congress for travel and for other funds have been materially reduced. Among those completely stricken out are the subscription of the U. S. to the International Prison Commission, $4,088; participation in the Seventh International Conference of American States, $80,000; contribution towards the maintenance of the Bureau of the Interparliamentary Union, $7,289; contribution towards publication of annual tables of constants, chemical, physical and technological, $500; payment of quota to support International Institute of Agriculture at Rome, $5,400; the International Road Congress quota, $3,000; the annual contribution of U. S. to International Society for Exploration of Arctic regions by means of airship for establishment of geophysical observations in inner Arctic regions, $300; convention relating to the liquor traffic in Africa, $55. For attendance at the World Radio Conference in Madrid, there will be available $80,000 instead of $90,000, and for the share of the United States in the International Fisheries Commission there will be $25,000 instead of $31,500. The United States will continue to support the Pan-American Sanitary Bureau, the International Office of Public Health, the International Hydrographic Bureau; the Gorgas Memorial Laboratory ($40,000 instead of $50,000 as in House bill); the American International Institute for Protection of Childhood; the International Statistical Institute at the Hague and the International Technical Committee of Aerial Legal Experts.

A NEW way of making photographic plates see very short ultra-violet light was reported to the American Physical Society at its meeting in Washington by Drs. A. J. Allen and R. Franklin, who are on the staff of the University of Pennsylvania and the Bartol Research Foundation. Ordinary photographic plates were coated with a solution of a special acid, called amino G acid. This left a durable layer of crystals that gave off bright blue light when the invisible ultra-violet light fell on them. The fluorescent light penetrated the photographic emulsion and thus recorded the very short ultra-violet radiation that can not produce the effect itself. Mineral oils that fluoresce have been used in the past for the same purpose.

RADIUM, x-rays, benzene and its various compounds, such as arsphenamine, are all known to produce injuries to the blood-forming tissues, especially the bone marrow, in certain doses and with certain susceptible people. On the other hand, these agents are used in the treatment of blood diseases. In a report to the American College of Physicians, Dr. Edwin E. Osgood, of the University of Oregon Medical School, reviewed the effects of these agents and the conditions under which they exert an action upon the blood-forming tissues. It was stated by Dr. Osgood that serious poisoning from these substances in the industries is not uncommon, but might be prevented by periodic blood examinations, elimination of the more susceptible individuals, reduction of exposure by local ventilation in benzene cases and the use of less toxic substances.