SCIENCE NEWS

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PROFESSOR BOHR AT PASADENA

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PAIRS of electrons, one positive and one negative, are sometimes produced when gamma rays from the element thorium pass through matter. This was reported by Dr. Carl D. Anderson, of the California Institute of Technology, in a conference, as a support of Dr. R. A. Millikan's contention that cosmic rays are originally mostly photons, or "bits of light," like gamma rays. Dr. Anderson has observed that among the energetic cosmic ray electrons there are about as many positive as negative electrons, as if they were produced in pairs.

Dr. Niels Bohr, the great Danish physicist now in Pasadena, said that after listening to the evidence it was scarcely possible to doubt the reality of the positron. He is the particular authority for modern theoretical physicists, yet he gave them something of a shock when he said that although theory had predicted the positron few theoretical physicists would have dared emphasize that before experiment had brought it out. The basis for our belief in the positron is therefore almost entirely an experimental one.

Dr. Bohr, on May 18, began a series of lectures on the foundations of atomic mechanics. He began with a careful discussion of the famous uncertainty principle, which has in recent years received unhappy treatment. He explained how the act of observation disturbs an electron or atom so that we must remain uncertain as to what its behavior would have been had we not observed it. If we give up the idea of trying to find what it would have done we save ourselves a great deal of worry and see the problem more rationally. Paradoxes then all disappear and atomic mechanics can describe all phenomena, provided we do not inquire about the atomic constitution of our measuring apparatus. When, however, we examine too closely we get into trouble with relativity. Physicists are stumped at this point and need further experiments to help them out.

If you are in a hurry you can't be too particular about energy. This is a version of the so-called uncertainty principle, which Professor Niels Bohr, of the University of Copenhagen, is driving home to physicists at Pasadena. When one body shoots by another and transfers energy to it, one can not inquire too closely as to whether the principle of conservation of energy has been violated, because it takes time to measure energy exactly. This fact helps clarify certain difficulties which old-fashioned physicists worried about.

Professor Bohr's main purpose is to get investigators to stop worrying about questions which have no possible solution. In return for this sacrifice of vain curiosity, he points out that paradoxes which have been proposed by Einstein and others dissolve themselves.

The Danish scientist is a master of simplification, and presents in brief and elementary form proofs which others achieve only after complicated mathematical developments. He showed in a few lines how material particles scatter each other according to the same law as that deduced for light by Lord Rayleigh when he explained why the sky is blue. In the optical case the blue light is more easily scattered than the red. Blue photons are heavier, so that here is a case where heavier bodies are pushed aside more easily than light ones. The same curious fact is shown when neutrons scatter protons a million times more frequently than the much lighter electrons.

A STRATOSPHERE BALLOON ASCENT

WITH the goal of floating eleven or more miles above the earth, higher than man has ever gone before, a stratosphere balloon with airtight man-carrying gondola of special design will rise from Soldiers Field, Chicago, in late June or early July as a part of the science program of the Century of Progress international exhibition.

Within the seven-foot diameter ball hung from the 600,000 cubic foot balloon will be two men, one a pilot and the other a scientist.

Lieutenant-Commander T. G. W. Settle, Navy expert who is licensed and qualified to pilot every type of aircraft known, will be in charge of navigating the balloon to its great height and back to earth.

Professor Auguste Piccard, the Belgian physicist, whose ten-mile-high balloon ascensions in Europe now are world records will probably be the scientist. If Professor Piccard can not make the flight, Professor A. H. Compton, of the University of Chicago, will designate one of his colleagues in cosmic ray research to take the stratosphere ride in the interest of science. Measurements of cosmic rays will be one of the main scientific objectives of the ascension.

A magnesium metal alloy, known as dowmetal, will be used in constructing the spherical gondola in which the men and scientific instruments will be housed during the flight. Dowmetal is a third lighter than aluminum. It is the metallurgical creation of the Dow Chemical Company of Michigan, who are now constructing the gondola. This saving in weight, coupled with a balloon that is a fifth larger than the one used by Professor Piccard on his previous flight, makes the exploration of the eleventh and even the twelfth miles above the earth extremely likely. The Piccard flights reached a little over ten miles altitude.

Tentative plans have been made to broadcast the flight, minute by minute, from the stratosphere to a ground radio station from which it would be relayed over one of the national radio chains.

The National Aeronautic Association has given its approval of the ascension and it will provide altitude instruments which will make the height records official for world record acceptance.

Near the top of the atmosphere in the stratosphere the balloon will hold 500,000 cubic feet of gas, which is

100,000 cubic feet more than the previous Piccard balloon. But at the start only about 125,000 cubic feet of very pure hydrogen gas will inflate the giant gas bag, which will have a pear shape due to its inflation to only about one fifth capacity. As the balloon rises, and most of the atmosphere and its pressure is left behind, the gas will expand tremendously and at the greatest height the balloon will be fully filled.

To obtain the greatest possible lift the Union Carbide and Chemical Company will furnish hydrogen gas of a purity of 99½ per cent. or better. Oxygen carried in tanks and released as needed within the gondola will allow the crew of two to live safely at stratosphere altitudes where there is practically no air. The balloon is being made by builders of the Navy's giant airships, the Goodyear Zeppelin Corporation at Akron, where Commander Settle is at present serving as airship inspector for the Navy.

The take-off will occur at ten or eleven o'clock in the evening, to take advantage of the cool night temperature during the early hours of the flight. As the sun rises the balloon will rise with it, ascending into thinner and thinner air as the heat of the sun expands the gas.

The greatest height above the earth should be reached about mid-afternoon when the sun is hottest. Then the descent will be made and the landing should be made in the evening about dark.

The great crowd of spectators which will throng famous Soldiers Field to watch the beginning of the flight will get a thrill as the balloon rises. A few hundred yards to the southeast of the starting point there are the 628-foot towers and cables of the Century of Progress skyride and the balloon will be shot up at about twenty miles per hour in order to clear this hazard with safety.

The exact day of the start will depend upon weather conditions. Where the balloon will land will depend on wind directions and other meteorological factors. Even if the magnesium metal sphere drops into one of the Great Lakes, it and its human and scientific freight will be rescued safely because the air-tight ball will float for hours.

HOW FILMS HOLD FAST TO METALS

BETTER protection for metal surfaces against rust and corrosion may be one of the practical results of an important discovery in pure science just reported to the Royal Society by two British physicists, Professor G. Finch and Dr. Quarrell, of the Imperial College, London.

Their discovery has to do with the way thin films of atoms or molecules arrange themselves when they are deposited on the surfaces of other metals by the special electrical method known as "sputtering." They found that the atoms in such films arranged themselves in the shapes of the metallic crystals underlying them, and not in the crystal shapes proper to their own natural makeup. Thus aluminum deposited on platinum assumed the dimensions of the platinum crystals so far as length and breadth were concerned, though the aggregations of atoms kept the greater height characteristic of aluminum. In this case the aluminum actually became denser than normal, because in two of its dimensions it had patterned itself upon the denser metal, platinum.

A deposit of zinc oxide upon zinc again crowded its crystals to fit them to the dimensions of the smaller zinc crystals. However, in this case the zinc oxide crystals grew taller than normal, so that their total volume remained unchanged.

The significance of the shaping of the deposited substance's crystals to fit the shapes of the underlying metal lies in the fact that there must exist between the crystals of the deposit and those of the substratum a special union or bond that will hold very firmly against any disruptive force. The deposited film is no mere loose layer laid over the surface, but is gripped hard by every atom in it.

The influence of the underlying metal extends for some little distance upwards. The crystal shapes of the underlying metal were preserved through a deposited layer as much as fifty atoms thick, their x-ray photographs showed. These studies of the physical properties of the films they have already deposited are being continued and new films are being made for further research.

ROBOT CLOCK ANNOUNCES TIME FROM THE PARIS OBSERVATORY

CALL an Odéon exchange telephone number in Paris at any hour of day or night. In clear, human tones the exact time, correct to a small fraction of a second, will be heard. Not a living operator but an automatic machine speaks. This speaking clock is set up at the Paris Observatory where time is determined by astronomical observations for the French nation.

At a recent meeting of the Société Astronomique de France, Dr. Ernest Esclangon, director of the Paris Observatory, described the device. The idea was first conceived, and preliminary experiments made, by M. Edouard Belin, pioneer inventor in the transmission of pictures by wire and radio. The final apparatus as now installed was made by the Maison Brillié, scientific instrument makers of Paris, under the supervision of their director, M. Mayer, and engineer, M. Nimier.

The speaking clock uses essentially the same methods that have made possible talking motion pictures, and the machine is driven by a synchronous electric motor, which is controlled by an accurate pendulum clock. In ordinary sound film a narrow strip along one edge carries the sound record, either in the form of a black line of varying width, or a series of cross lines of varying density. In both types, the light from an electric bulb shines through the sound track on to a photoelectric cell, which converts the variations in brightness, caused by the passing film, into a varying electric current. This current is amplified and operates the loud speakers.

In the Brillié machine, time speaking sound record is recorded on strips of paper, wound around an aluminum drum. Instead of having the light pass through the film, it is reflected from a small strip on its surface, into the photoelectric cell. As light or dark parts of the strip pass under the light, the reflected illumination varies, and the cell produces the necessary varying current. There are 90 strips of paper, 24 for the hours, 60 for the

minutes and 6 for the seconds. The drum, which is about a foot in diameter and two feet long, turns continually on a horizontal axis at the speed of one revolution in two seconds.

There are three reproducers, each consisting of the necessary electric lamp, lenses and photocell, which are carried along the drum. Each hour the one for announcing the hours shifts from one strip to the next; each minute the minute reproducer steps ahead and every ten seconds the reproducer for seconds makes progress. At midnight the first one goes back to start over again, at the end of each hour the minute reproducer returns, while the seconds one starts over at the beginning of each minute. Connections are automatically made so that the reproducers speak in the proper order, giving first the hour, then the minute and then the second, which is followed by a click marking the exact moment that has been announced. Announcements are given every ten seconds.

At the end of each minute, however, the announcement is different. Then it says "At the third click it will be exactly . . . such an hour . . . such a minute," then, at seconds 58, 59 and 60, there are clicks.

Though the machine is kept in motion continually, the exciting lamps, and the requisite amplifier tubes, are ordinarily turned off. When a telephone connection is put through to the clock at the observatory, relays operate to turn them on for an announcement. Thirty telephone lines to the clock allow that number of subscribers to call simultaneously.

The clock's announcement is also broadcast every morning at 8:30. Dr. Esclangon suggested that it might be well to devote a radio station especially to it, and let announcements of the time be given continually through the day and night.

THE ORIGIN OF PETROLEUM

PETROLEUM, now one of the principal wealths of the world, was originally garbage—offal from the endless complex banquet of the sea, that not even the bacteria in the bottom slime would eat.

This un-pretty picture of the origin of "black gold" comes from a report presented at the meeting of the American Petroleum Institute held at Tulsa, Oklahoma, by Dr. Parker D. Trask, of the U. S. Geological Survey. Dr. Trask and his associates have for a number of years been conducting an exhaustive study of both modern and ancient sea-bottom deposits, seeking for further knowledge of how petroleum was formed in the first place, so that seekers after oil may have a better idea of what kinds of geological formations are likely to yield paying results to their expensive drillings.

They found that fine-grained beds contain more organic matter than coarse-grained—clay more than silt, silt more than sand. They learned, as was to be expected, that where the sea bottom is rolling and irregular, richer deposits are to be found in the hollows than on the submarine hilltops or slopes. They found, above all, that the dead bodies of the myriad sea plants that escaped eating by fish and other marine animals were not left as raw materials for oil-making until even the bacteria of the bottom slime had taken from them such materials as they wanted for themselves.

This bottom bacterial action seems to be of the highest importance in the formation of the stuffs that eventually become petroleum. Crude plant materials, and such fishes and other animal carcasses as settle to the bottom, have relatively high nitrogenous and carbohydrate contents, which are unsuitable for working over into oil. The food requirements of the bacteria seem to be especially aimed at these non-oil-producing food materials, thereby leaving the organic débris in better condition for the oil-making processes themselves.

Oil-making seems to be an exceedingly slow job. It is not going on in the sediments now forming on the ocean bottom, but it is in progress in sediments laid down on the sea bottoms of geological yesterdays. The steps are not known with anything like satisfactory certainty, but there seems to be no doubt that great increase in sedimentary thickness, with resulting pressure and heat, squeeze and fry out the material that eventually becomes petroleum. It then seeps along migration paths through sandy strata, and collects in pools where impervious rock layers bar its further wanderings.

ITEMS

AFTER several months in which they have kept fairly far apart, Jupiter and Mars, the two bright planets that shine high in the evening southern sky, are approaching close together. Jupiter is the brightest object in the evening sky at present, with the exception of the moon, and Mars, reddish in color, is a short distance to the right. Now about five degrees apart, at the end of the month they will only be a degree from each other, and on June 4 they will be separated by a quarter of a degree, about half the moon's diameter. Mars will then be to the south of its larger neighbor. A few days previously, on June 1, the moon will pass close to both of the planets, making an interesting spectacle.

CORN planting has been so much delayed by the long period of wet weather over almost the entire eastern half of the country that the situation is now described as "critical" by the U. S. Weather Bureau. In the central Mississippi and Ohio valleys, much of the land has not even been plowed, let alone planted, and a great deal that has been prepared will have to be reworked because of its packed condition, the result of long-continued heavy rains. In Iowa, planting during the week continued slow or at a standstill. Other crops, especially spring wheat and oats, are also being held back in the soggy corn belt states. But more cheerful reports come from the drier lands to the northwest; offset again by stories of drought in the southwestern grain areas.

HIGH blood-pressure, known to physicians as hypertension, runs in families, it appears from a study of statistics reported by Dr. William Allan, of Charlotte, North Carolina, at the Congress of American Physicians and Surgeons meeting in Washington. In one series of cases, both parents of patients having high blood-pressure also suffered from the condition. In 349 out of 480 cases, one

of the patient's parents suffered from the same condition. In 121 families with both parents having high blood-pressure more than three fourths of the children suffered from it also. In 216 families with one parent having this condition, over two thirds of the children also had it. In 349 families, three fifths of the brothers and sisters of high blood-pressure patients were found also to have the condition.

DR. L. THATCHER has reported to the *Edinburgh Medical Journal* that a child of eighteen months was admitted to a hospital in Edinburgh, much under weight and unable to walk alone because of weakness. Doctors at the hospital diagnosed the ailment as a kidney inflammation. The child died. Then it was found that the child had received a daily dose of irradiated ergosterol equal to twice the recommended dose and that this severe dose was continued during the summer despite the fact that he was living an outdoor life at the seashore. The double dose of vitamin D resulted in calcium being deposited not only in the bones but in the kidneys. Death in this case was caused by too much vitamin D.

A GELATIN diet has given physicians new knowledge about a certain type of Bright's disease. Results of feeding gelatin to patients suffering from this condition were reported by Dr. G. Philip Grabfield, of Boston, to the American Society for Clinical Investigation. The gelatin diet was used because gelatin is one of the protein foods that does not contain sulfur. Dr. Grabfield was investigating the fact that patients suffering from this particular form of kidney disease tend to hold on to the sulfur in the diet even more than to the nitrogen. Patients who get swollen ankles and legs, known as edema, fail to excrete sulfur as well as nitrogen, while patients suffering from the same disease but without the swelling or edema fail to excrete nitrogen alone.

TEN minutes instead of ten days is the time required by a jeweler to regulate a watch to maximum time-keeping efficiency with the use of a new electric watch timer demonstrated to the Horological Institute. Accurate time intervals are given by a special electrical current of 100 cycles per second accurate to one part in ten million furnished by telephone companies from a constant frequency generator in New York. This current drives a synchronous motor similar to those that have come into such wide use in electric clocks. Within the new timer developed by the Bell Telephone Laboratories an image of the watch balance wheel is reflected on a mirror and a flashing lamp controlled by the precise synchronous motor flashes. This makes the watch's balance wheel seem to stand still when the watch and motor have exactly the same speed. The stroboscopic effect allows the jewelers to inspect and diagnose any trouble in a watch as well as regulate its rate of time-keeping quickly and accurately.