SCIENCE NEWS

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SOME PAPERS PRESENTED BEFORE THE NEW YORK MEETING OF THE AMERICAN PHYSICAL SOCIETY

AT the meeting of the American Physical Society, in New York, which opened on February 24, Dr. Ernest O. Lawrence and Dr. J. W. Beams, of Yale University, told of their studies of the length of time required for this "photoelectric effect." Less than a three billionth of a second is all the time that it takes an electron to be knocked out of a film of potassium metal when light strikes it in a photoelectric cell—the device that has made television and radio photographs possible. In the photoelectric cell there is a film of potassium, and another electrode. When light strikes the film the electrons travelling from the film to the other electrode cause a minute electric current, which can be amplified by means of vacuum tubes. In this way a current of any desired magnitude, but one which varies with the illumination of the cell, can be obtained. Because the response of the cell is practically instantaneous, it can be used in television and wire and radio photographic service.

MEMBERS were able to see by wire through walls and around corners when they were given a special demonstration of the process of television developed by the Bell Telephone Laboratories. This was the process that was used last April in the first successful long-distance television tests, when Secretary Hoover spoke in Washington and was seen in New York. At a session of the society at the Bell Laboratories, Dr. Herbert E. Ives, under whose direction the method was developed, explained its operation, and the recent improvements that have been made on it.

STUDY of such devices as radio loud-speakers on the basis of the sound waves that come to the listener's ear is now possible with an instrument invented by Dr. Dayton C. Miller, of Case School of Applied Science, Cleveland. Dr. Miller described this new use of his apparatus, which he calls the "phonodeik." He made the experiments in conjunction with John R. Martin. The phonodeik makes a photographic record of the sound wave as it is received by the ear. Dr. Miller's method is to connect the loud-speaker undergoing test to a microphone, then to record the output on the phonodeik. A similar record can be made of the original sound, and by comparing the two, the characteristics of the speaker determined. When a vacuum tube voltmeter is substituted for the speaker, the experimenter can determine how much distortion is introduced by the electrical system, and make allowances for it.

NECKTIE and clothing manufacturers probably still have plenty of colors left with which to add to the brilliance of life. Altogether there are slightly over two million separately distinguishable colors possible. This is the conclusion by George B. Welch, of Cornell University, who spoke before the society.

BOWLING enthusiasts will now have available a scientific study of their favorite pastime. Dr. L. W. Taylor, of Oberlin College, told of apparatus that he has developed to study the motion of the ball in a bowling alley. A recording device registers to the hundredth of a second the passage of the ball at half-meter (about 20-inch) intervals. Instead of rolling the ball by hand, a catapult is used, so that the force used can accurately be controlled. Studies already made with the device indicate that the accepted theories of the ball's motion are not quite correct, but that the friction seems to vary with the ball's speed.

STELLAR EVOLUTION

A STAR that exploded, and is now changing to a nebula, in reverse of the usual process of stellar evolution, is the rare spectacle being observed at the branch station of the Harvard College Observatory at Bloemfontein, South Africa. This unconventional behavior of Nova Pictoris, as the star is called, was discovered by Dr. J. S. Paraskevopoulos, who is in charge of the branch station, Dr. Harlow Shapley, director of the observatory, announced through Science Service. Confirmation of the discovery has just been received from the Observatory of LaPlata, in Argentina.

Until the spring of 1925 this star was too faint to be seen with the unaided eye. Then it suddenly flared up as a nova, or "new star," and was discovered by R. Watson, a South African amateur astronomer. The star is in the constellation Pictor, the painter, a group not visible from northern latitudes.

"The evolution of stars," Dr. Shapley explained, "is generally thought to be in the direction from nebula to star, but in this instance, and in two or three others, the transformation is in the opposite direction, and astronomically speaking, is very rapid. All of these reversed cases are associated with the so-called novae, or new stars.

"Examination of earlier plates in the great collection at the Harvard Observatory, in Cambridge, where the southern photographs are stored, showed that before its outburst, it had been of the twelfth magnitude, and astronomers believe that it will gradually return to that same degree of faintness.

"Dr. Paraskevopoulos' discovery was based on photographs of the star, made under various conditions, with the rapid photographic telescopes which he has recently transferred from the former Harvard station in Peru to the new site in South Africa. A ring or shell of nebulous matter appeared around the outer edge of the image of the star, and has gradually grown larger and more dis-

tinct. The phenomenon clearly indicates that the outburst of the nova, and its rapid increase three years ago to ten thousand times its former brightness, was actually an explosion of the star, which blew its outer parts away from the nucleus.

"The ring of nebulosity now observed is the former outer portion receding with a velocity of several hundred miles a second. Future observations will show whether the explosive transformation will result in one of the permanent typical 'planetary' nebulae of which a hundred or so are known among the stars, or whether the receding atmospheres will gradually dissipate into space, leaving the nucleus as a typical star.

"The normal course of stellar evolution," Dr. Shapley stated, "is believed to be in the direction of contraction, and for perceptible progress requires billions of years; but these suddenly expansive transformations are in the reverse sense, require but a few years, and may be exceedingly important in knowledge of the development of celestial bodies."

The observation from the University of LaPlata, which confirmed the Harvard astronomer's detection of the expanding gaseous shell around Nova Pictoris, was made by Professor Hartmann, director of the National Observatory of Argentina. His observations were made visually with a large refracting telescope. He cabled that the angular diameter of the ring is now one second of arc. Dr. Paraskevopoulos' description of his observations is being published by the Harvard College Observatory.

MOUNT LASSEN

MT. LASSEN, America's principal active volcano, is still asleep, but the spectacular effect produced by blowing clouds of snow, mixing with the steam that the crater is continually emitting, may give the illusion of a return to activity. The effect is especially striking when it occurs near sunrise or sunset, according to R. H. Finch, associate volcanologist of the U. S. Geological Survey, whose work it is to keep his finger on the pulse of the slumbering volcano. That it is merely slumbering, and not dead, is indicated not only by the steam, but by frequent earthquakes. Sometimes several shocks occur on the same day.

Evidence of subterranean activity also comes from Glass Mountain, about seventy-five miles north of Lassen Peak, and in the Modoc lava beds. Fairly recent lava flows are to be found nearly all the way between Glass Mountain and Lassen Peak, and Forest Service officials in the vicinity report about half an acre of land covered with pumice which is very hot. By digging but a little way into the pumice much higher temperatures are reached, and near the pumice bed is a deep fissure emitting steam.

With George L. Collins, of the National Park Service, Mr. Finch attempted to make temperature measurements and to take photographs on the mountain, about 7,850 feet high, during January, but were driven back by a heavy snow storm. They are now planning to conduct further explorations in the spring.

According to the Indians the heat of Glass Mountain has been known for many years, and earthquakes originating in the mountain and accompanied by rattling noises have been noted by Forest Service officials for at least fifteen years.

MAN-MADE EARTHQUAKES

MAN-MADE earthquakes, recorded some distance away upon a simple form of seismograph weighing only a few pounds, are helping Russian engineers to survey the site of the proposed Turkestan-Siberian railroad.

The method is to detonate charges of explosives underground and to record the travel of vibrations through the ground in different directions. By a minute study of the records so obtained it is possible to secure data on the geological formation of the locality.

The new seismograph invented by Professor Paul M. Nikiforov, director of the Physico-Mathematical Institute of the Russian Academy of Science at Leningrad, is similar to one recently invented in the United States by Dr. John A. Anderson, of the Mt. Wilson Observatory in California. Its main part, the pendulum, is a small vertical cylinder of pure gold suspended a little off center on a pair of fine wires. Whenever there is any vibration the cylinder turns slightly in proportion to strength of the shock. A tiny mirror attached to the pendulum reflects a beam of light on a constantly advancing sheet of photographic paper. Every turn of the cylinder, no matter how small, shifts the light spot considerably and it traces a wavy black line. Several of the new instruments are now installed on earthquake stations in Turkestan and Crimea and give complete satisfaction.

THE DETECTION OF FLAWS IN CASTINGS

USING radium rays so penetrating that they can go through pieces of metal—15-inch pieces of metal—to test for hidden flaws in large castings is one of the latest accomplishments of the Russian State Radium Institute.

These "gamma rays," as they are called, are similar to X-rays, but are of much shorter wave-length. They are more penetrating and can pass through pieces of metal too thick to be examined with the X-rays. Examination by radium is said also to be cheaper than with X-rays, because the same radium can be used over and over for an indefinite time. Large and expensive photographic plates are not required, since the rays, after passing through the object, act upon a special, sensitive electroscope. The test record is preserved for future reference in the form of a simple diagram automatically traced. Another advantage is that the gamma rays speed up the inspection—it may be cut down to a couple of minutes for a large casting—while X-rays require a very long exposure, often of several hours, when metal is more than two or three inches thick.

The apparatus, as developed by the Russian scientists, is very simply constructed. A tiny glass capsule with a radium preparation is inserted into a deep hole bored in a large lead ingot. This stops all rays, except a narrow strong beam that goes along the bore. This beam pierces the casting and encounters two filaments charged with electricity and enclosed within a copper cage. There is an air space between the filaments and the cage which act normally a perfect insulator, allowing no electric cur-

rent to pass through it. But as soon as gamma rays have a chance to get in the cage they ionize the air and turn it into a conductor.

Electricity from a battery flows from the filaments to the copper cage and from it passes through a galvanometer and back to the battery.

As intensity of the rays changes with thickness of metal pierced by them, the rate of ionization varies accordingly. Therefore the flow of electric current exactly mirrors the shape of the object under test. Any deviation at once shows that some imperfection is present.

A NEW TYPE OF HEAVY LOCOMOTIVE

A NEW type of locomotive, the heaviest yet used in Europe, is being built in Germany. It is especially designed to haul heavy freight trains over tracks cursed with many curves, and through regions where water is scanty.

The Garrat locomotive, as the new engine is called, shows a radical departure from the usual types of locomotive design. The driving wheels, of which there are two sets of six each, are not placed under the main body of the locomotive at all, but under the tenders. Of these there are two, one of them pushed ahead of the engine and the other pulled behind in the usual position. The cylinders are as far apart as possible, the forward pair being under the forward end of the front tender, while the rear pair is under the opposite end of the rear tender. This necessitates long steam lines, but the builders claim that they are able to deliver steam at 189 pounds pressure with entire success.

This type of construction makes the locomotive a three-section affair, articulated by two pivots. Although total length is 75½ feet, it can turn in a circle of 300-foot radius.

The forward tender carries nothing but water, the rear one both water and fuel—either oil or coal. In addition, there is a third supply of water carried in a tank slung under the boiler, in the space usually occupied by the driving mechanism. In all about 27 tons of water can be carried, and about 15 tons of fuel. The unusual capacity for water is designed to permit the locomotive to operate in arid regions.

The total weight when ready for service is 206 tons.

ITEMS

A NEWLY-INVENTED German machine, designed to do for Occidental grain fields what Chinese coolie labor has done for centuries in the rice fields of the East, is attracting considerable attention on the part of British agriculturists. Instead of sowing seed like an ordinary grain drill, it sets out sprouted and rooted seedlings at the rate of 12,000 plants per hour, one to every square foot. It is claimed that this method of raising grain requires only one thirtieth as much seed as now used, and that it will yield from three to five times as many bushels to the acre. This is said to be the result of the greater freedom each plant has to develop a more vigorous root growth beneath the soil, and especially to tiller, or "stool out," above its base. From 30 to 40 stalks per plant are usually developed.

MEDIEVAL cathedral builders, if they could come back to life, would probably regard with superstitious awe the modern power-driven saws, drills and planes that speed up the shaping of the thousands of tons of stone used in the construction of Washington cathedral, now going up on Mount Saint Alban. Each of the 260,900 stones that the builders' estimates call for must be separately designed and shaped for its particular place. As soon as the architect determines the specific shape and dimension, each of the stones that weigh from 300 to 500 pounds apiece, is numbered. These numbers appear on all drawings, on the individual time cards, which record the progress of each stone through the cutting plant, on the completed stone and on the plan followed by the mason. The cost of the stones varies from $10 for the plain ones, used for the basic construction, of which 146,000 will be needed, according to the estimate, to $300 each for the 5,000 elaborately sculptured ones. In addition to this, thousands of molded and carved stones at $50 and $100 apiece will go into the complete structure.

NEW finds of fossil footprints in the rocks of the Grand Canyon of Arizona, but this time on the north rim, fourteen miles from the site of previous discoveries on the south rim, are reported by Dr. Charles W. Gilmore, of the U. S. National Museum, and Glenn E. Sturdevant, government naturalist of Grand Canyon National Park. Slabs bearing the foot imprints of small reptiles or salamander-like amphibians were found at two levels, one in the Coconino and one in the Supai formation. These correspond with two of the three formations on the other side of the canyon in which tracks have been found during the past few years, but further exploration and examination of specimens will have to be carried on before it can be determined whether the levels match up exactly and whether the tracks represent the same kinds of feet. The fossil footprints from the south side of the canyon thus far discovered represent 36 species, distributed among 28 genera.

EVIDENCE that stone age man lived in Ireland, hitherto lacking, is now supplied by J. P. T. Burchell, of London. Mr. Burchell has discovered a rock shelter typical of the Mousterian period, when Neanderthal man roamed Europe, on the Sligo coast, and beneath it and along the beach he has found large quantities of the roughly flaked flint implements which these ancient savages made. No bones have been turned up as yet, but the quantity of tools and weapons leaves no doubt that some one was in Ireland to make them. Like other sites of the same culture, this shelter was inhabited during an interlude between two advancements of the ice of the most recent glacial epoch. Evidence on this point is cited by Mr. Burchell in two forms: the layer in which the implements are found is buried under 35 feet of boulder-filled clay, such as glacial deposit; and one of the largest of the stone implements is scarred with glacial striae or scratches, indicating that it was caught under a glacier and scraped over other rocks. The finds have been examined by J. Reid Moir, one of the foremost of British authorities on the stone ages, who pronounces them authentic. A complete technical report will probably be published in the near future.