# SCIENCE NEWS

## A NEW CHEMICAL ELEMENT

*Science Service*

CLAIMANTS of two nationalities dispute the honor of being the discoverer of one of the six missing chemical elements that scientists have confidently predicted will some day be isolated.

The disputed position in the periodic table of chemical elements is known as Number 72. Professor G. Urbain, of the Sorbonne, announced some years ago that he had identified and isolated a new rare earth element that he called "celtium" as a tribute to the French or Celtic race. Professor A. Dauvillier within the last few months has announced to the Paris Academy of Sciences that he finds by X-ray spectroscopy of rare earth mixtures that Urbain's celtium fits into the gap in the known elements where Number 72 should be.

But from Denmark comes the counter claim that element 72 is not a rare earth metal, like cerium and thorium, whose oxides are used in gas mantles, but an element very similar to the metal zirconium. D. Coster and G. Hevesy, of the Copenhagen Institute for Theoretical Physics, have investigated the spectra obtained when extractions from zirconium minerals are made to produce X-rays and they have found lines in the resulting spectrum, hitherto unknown, that correspond to those that element Number 72 should have. But the lines found by these Danish scientists are not the same as those found by the French physicist and chemist. The Danes have patriotically proposed that the new element they have announced be named "hafnium," derived from Hafniæ, meaning Copenhagen.

If the discovery of Dr. Coster and Dr. Hevesy is confirmed, hafnium may sometime be found in considerable quantities, as they report that "in a Norwegian zirconium mineral the new lines were so intense that we estimate the quantity of the element 72 present in it to be at least equal to one per cent." They believe that ordinary metallic zirconium contains at least one hundredth to one tenth of one per cent. of the new element. Experiments are under way to isolate this new element and determine its chemical properties as it is at present known by its spectrum alone.

If, on the other hand, the claims of Professors Urbain and Dauvillier are substantiated by time, Professor Urbain will have the credit of discovering two of the 92 possible chemical elements, a unique distinction. He previously discovered and isolated lutecium, naming it in tribute to his native city, Paris, known in ancient times as "Lutecia."

Many of the chemical elements have been first discovered in the spectrum and then found and isolated by chemical means. Helium was discovered in the sun in 1868 by lines seen in the solar spectrum and not until 1895 was it isolated by Sir William Ramsay. The X-ray spectrum of a substance under investigation is much more certain of interpretation than an ordinary light spectrum because the positions of its lines are directly and simply related to the arrangement of its elements in what is called the "periodic table." Moseley, the young British physicist who was killed early in the war, was able by applying X-ray spectroscopic methods to arrange the known chemical elements in an orderly series according to their atomic numbers. This classification is much more enlightening than the periodic table devised by the Russian chemist, Mendeléef, in 1869. Moseley's work showed that there are spaces for several elements that man does not yet know and among them was Number 72. Numbers 43, 61, 75, 85 and 87 are still missing, but by their positions in the series, scientists have predicted the properties of the unknown elements. The position of 72 in the series is such that it must be related both to the rare earth metals and to the metal zirconium, so the theoretical data do not help in deciding the present scientific controversy.

## WASTE WOOD PRODUCES CHARCOAL AND ALCOHOL

AFTER hundreds of unsuccessful attempts have been made to utilize small waste wood in the carbonization and wood distillation industries, Professor O. E. Stafford, a University of Oregon man, has perfected a process that is commercially successful. A superior grade of charcoal and wood distillation products used in a number of basic industries can be obtained from mill waste under his process.

Professor Stafford first demonstrated his process scientifically on the University of Oregon campus. He and the firm of engineers behind him have now succeeded, after several years' labor, in demonstrating it as a practical commercial process. Two wood distillation plants on the Atlantic Coast, one of them controlled by a big corporation, placed every resource at Professor Stafford's disposal, and the success of the process was completely demonstrated.

By the new process a fine grade of charcoal can be obtained as well as the usual by-products of carbonization, acetic acid, acetone and wood alcohol, basic in the manufacture of such articles

as dye, paints, varnishes, celluloid, smokeless powder and artificial leather. A considerable amount of charcoal is used in the chemical industry; for example, in case hardening steel. Bagged charcoal is consumed extensively in many large cities. Charcoal briquets are in demand as fuel.

Cord and slab wood have been the accepted material used in making charcoal and its by-products. As small waste wood is materially cheaper than either slab or cord wood, the desirability of utilizing it in carbonization operations has long been recognized. Eight hundred applications have been made at various times at the Patent Office by those who thought they had hit upon a process of carbonizating small waste wood on a commercial scale. The failure of these efforts, up until the Stafford process was proved successful, has been due, in general, to heavy costs of installing and maintaining the complicated mechanical appliances required.

In 1920 after experimental demonstrations at Cambridge, Mass., work was continued in a plant of two hundred cords daily capacity at Kingsport, Tenn., which had originally been erected by the National Research Council during the war for chemical experimentation.

The commonly accepted practice of carbonization is to place cord or slab wood in large oven retorts made of steel plate. Fires in the furnaces beneath are started. Vapor outlets from the oven are provided, these outlets leading to condensers for the recovery of the liquid products of the distillation. The charcoal is withdrawn after the wood has been carbonized.

The retort used in the Stafford method is a cylinder thirty-two feet high and nine feet in diameter. The cylinder is set vertically and the appliances are such that the wood to be carbonized is fed continuously into the top, while charcoal is withdrawn continuously from the bottom. A remarkable feature of the process is that no heat is applied to the cylinder after the process once is started, the carbonization of the wood being spontaneous under the conditions which the invention maintains.

In previous processes the principal difficulty encountered in the use of small waste wood has been that of transmitting heat to the interior of a mass of finely divided woody material in the retort. Such a mass is a poor conductor of heat. Only the portions of it in contact with the hot walls of the retort can in any reasonable time reach a carbonizing temperature. The numerous attempts to handle such material have had to do principally with overcoming this difficulty.

Formerly, the wood used in carbonization work has always contained moisture. But Professor Stafford experimented with perfectly dry wood. He found that when the dry wood is heated under his process to the temperature at which the charring begins the carbonization went along to completion without further application of heat from outside sources. This is referred to by chemists as an exothermic process.

The cost of installing a plant under the new plan is considerably less than that of building an oven retort plant of equivalent capacity. It has other advantages, among which are low depreciation and low labor and fuel costs as compared with other systems. It has not yet been demonstrated whether the charcoal made under the Stafford process can be used in the iron industry. The charcoal produced from small waste wood would have to be briquetted for direct use.

In the working out of the Stafford process in the Pacific northwest, Douglas fir would be the most available species of wood. It occupies an intermediate position between the hardwoods and the soft or resinous wood, such as the southern long leaf pine. Hardwoods give a high yield of wood alcohol and acetic acid, while the southern pine gives low yields of alcohol and acid but a high yield of turpentine oils and resins.

## THE CAPILLARIES

*Science Service*

IF the blood vessels of an average sized man were placed in a straight line continuously, they would reach around the globe two and one half times, Professor August Krogh announced at Yale in the Silliman Lectures, which have just been published in book form under the title "The Anatomy and Physiology of the Capillaries." Professor Krogh's researches upon the capillaries at the University of Copenhagen, Denmark, during the last decade won for him the Nobel prize in 1920.

Capillaries, which are the numerous microscopic blood vessels that join the arteries bringing blood from the heart to the veins which take the blood back to the heart, Professor Krogh believes to be the most important part of the blood system. Although the capillaries are very small, their great number affords a large surface so that the blood may easily furnish nourishment and oxygen to the tissues and readily remove the waste products from them. Professor Krogh has calculated that the surface of these minute blood vessels in an average man equals the area of a city block. Their number is so great, according to this investigator, that in a single piece of muscle with the cross section the size of an ordinary pin there would be eight hundred of these microscopical capillaries besides two hundred muscle fibers.

The capillaries have always been regarded as unimportant parts of the blood system, but Professor Krogh points out that it is only while the blood is passing through them that it is able to come in close enough contact with the tissues to actually furnish them with nutriment. Each one of these capillaries has a separate nerve of its own which enables it to close or open depending on the condition of the tissue it supplies. For example, when a muscle is being worked and needs considerable food and oxygen, nearly all the capillaries will be found open, while during rest a number of them will be closed.

## ICEBERGS IN THE ATLANTIC

*Science Service*

ICEBERGS will soon menace Atlantic traffic, Edward H. Smith, stationed on Coast Guard cutter *Senaca*, told a conference of the principal trans-Atlantic steamship managers held in New York on February 15. He is the man who, from a ship at sea, answers all requests from steamer captains for ice information during the danger season.

"Already field ice has been sighted on the Grand Banks of Newfoundland and it will soon stretch south," he said. "Two Coast Guard cutters, *The Tampa* and the *The Modoc*, fine new electric drive vessels capable of keeping the sea in all kinds of weather, have been detailed for ice patrol this spring. *The Tampa* in Boston is now preparing for her duty and will be ready to proceed as soon as the first of the 1923 icebergs appear off the Grand Banks. We will be on the job continuously until next July, when the danger of a berg drifting on the steamship tracks is quite remote."

He described the work of the international ice patrol undertaken by the United States government for the past ten years. The navigation experts were also told how bergs are formed and carried into the ship lanes by the ocean currents.

As a rule field ice appears off the east coast of Newfoundland the latter part of January, coming down in a narrow strip fifty miles or so wide, Mr. Smith said. By the latter part of April, the banks are entirely free of this field ice, which melts quickly in the lower latitudes. The berg ice carried down by the Labrador Current lasts until July.

Mr. Smith described how the patrol kept in touch with ice conditions, charted the drift of bergs and broadcast warnings. Commenting on the mistaken notion that the patrol destroyed the bergs, he told of measuring one berg which rose 248 feet above the water and extended 1,690 feet. There was enough ice in this one berg, he estimated, to fill every refrigerator in the United States for a month.

There is no means yet devised by which the presence of an iceberg can be detected during fog or darkness. The "feel" of the air and the temperature of surface water are unreliable, he said, but he held out hope that the sonic range finder developed by the navy can be perfected to give sound reflections from icebergs that will result in knowledge of the distance and direction of the danger.

## A LEAGUE OF INDIANS

*The National Geographic Society*

WITH the newly-revealed wonders of Chaco Canyon replacing our boyhood thrills at Chingachcook's exploits, and the Pueblos plunged into politics, we frequently ignore the remarkable Indian tribes of South America.

To-day, in Chile, lives the most numerous of all Indian tribes surviving in the Americas, the Araucanians, who retained their independence longer than any other natives of the western hemisphere. Writing to the National Geographic Society from Chile concerning his people, a full-blooded Araucanian Indian says:

"For more than three hundred years we waged war with the Spanish. The Araucanians, Araucanos, Nguluches or Mapuches, or whatever you may desire to call this virile race from which I sprang, is formed by four big groups of tribes: Pewenche, the people of the pine trees; Williche, the people of the south who occupy the mainland; Puelche, the people of the east, and Picunche, the people of the west.

"When in 1536 Don Diego de Almazio discovered Chile or Southern Land, unknown until then, and later in 1541 when Pedro de Valdiva conquered Chile, the Araucanians took their first step toward forming a league of clans comprising some two or three hundred people.

"In case of imminent danger, a war chief, Toki, was chosen by a general council. The election of a Toki was based upon the good health or strength of the man. The individual who could hold a heavy stump over his shoulder the longest was chosen as the Great Caupolocan.

"Zuniga, the great Spanish writer of the Golden Century of Spanish literature, commemorates the early heroism of my people in his famous 'epic' known as 'la Araucana.' He mentions the great chief Keupulikan or Caupolican, and his wife Guacolda who, when later imprisoned by the Spaniards, denied her marriage to him. Here we see that Arauco did not only have men leaders, but also women. Keupulikan, whose name means 'by divine conception,' has been re-

membered by all the Chilean citizens aa a national hero who fought for the defense of his life.

"In 1641 the King of Spain conceded to the Araucanians their independence, which was confirmed in 1655.

"A treaty was signed in 1876 with the Chilean government which had been formed in 1810. Temuco or Temu (Temu, 'tree') is where the great Colipi and General Urrutia, the general of the Chilean army and the Lonko of Arauco shook hands and agreed to build a city and to develop the natural resources of the Araucanion domain.

"My people call themselves Mapuches, which means people of the land, or that they are native there. All the Indians have their own reservations, but the fact that they live there in no way restricts their right to vote when election comes. In this they may be contrasted with the North American Indian who must give up his reservation to be a citizen."

## THE VENOM OF THE COBRA

*Science Service*

THE body apparently does not produce an antitoxin to combat the deadly venom of the cobra in the same way that it fights the poison of the diphtheria germ, Professor A. R. Cushny, of the University of Edinburgh, concludes from experiments which he has just completed. When he attempted to accustom rabbits to the poison of the cobra by giving them successive doses of the venom which individually were too small to prove fatal, the animals died when the accumulated amount of the poison was equal to a lethal dose even though the amount administered just before death ensued would have no effect on a normal animal.

"Evidence of the persistence of the poison in the tissues could be obtained in some cases a month after the injection," according to Professor Cushny. "This gives rise to no symptoms, but the animal succumbs to a subminimal additional dose." He also believes that it is probably held in the nerve ends since he could not find any trace of the toxin in the blood.

In the case of diphtheria toxin, the body can make a substance capable of destroying the poison if the doses of toxin administered are given in very small amounts at first and the dose is gradually increased. The subject finally becomes so immune to the toxin that a dose which would kill an individual who was not treated this way has no effect on the person who has the abundance of antitoxin in his system.

The cumulative action of cobra toxin shows that an antitoxin is not produced to counteract this poison. Lead and mercury compounds produce a similar cumulative action in that fatalities are caused by an accumulation of either of these substances by continued small doses, each of which taken alone is harmless, but when taken repeatedly become deadly.

## ITEMS

*Science Service*

X-RAY movies have been brought a step closer and fine details in bone structure have been revealed by the use of a new method of photographic plate sensitizing developed by Dr. C. Scheussner, of Berlin, according to information reaching the American Medical Association. By incorporating a radioactive substance with the light sensitive substance of the roentgenographic plate or film, he has been able to record certain wave lengths of X-rays that have never been photographed before. The radioactive substances placed in the emulsion emit their own rays when the X-rays come in contact with them. The result is described as startling. The negatives made by the new method bring out all the finer details in the structure of the bones, which otherwise can be observed only in the sawed ends of the bones themselves. It is hoped that injuries and pathologic changes that the ordinary X-ray plate is blind to will be recorded. There are different kinds of X-rays, varying in length, just as there are different colors of visible light, which also vary in wave length. This new X-ray plate development is analogous to progress that has been made in evolving photographic plates sensitive to red, yellow and green light. The ordinary photographic plate is sensitive mainly to blue and violet light and a dark blue sky will look white and a yellowish red flame will appear almost black.

WATERPROOFING of the bed and banks of the river Nile to prevent loss of water by seepage into the desert sands has been proposed as a means of helping stop the apparent spreading of the desert. The Sahara is scarred and seamed with dry beds of once refreshing lakes and other evidence that the water supply was formerly more abundant than at present. The Nile loses by evaporation and by seepage into the porous soil. The shortage in the last few seasons has cut down rice raising and there is little prospect for anything better the coming year. By converting the river into a waterproof canal along its course through the desert, more of the precious water could be saved for use where most needed.

THE Isle of Pines gets its name from its forests of pine trees said to exist there at lower altitudes than anywhere else in the tropics.