

fect of oxides was generally associated with high electrical resistivity of the oxides and this led to extensive studies of alloys of silver containing aluminum, beryllium or silicon.

Then the problem was how to get an oxide film of these metals formed before the silver itself would oxidize. The fact that sterling silver requires 92.5 per cent. silver prevented the adding of large amounts of these metals analogous to practice in stainless steel making. The greater affinity of aluminum and beryllium for oxygen came to the rescue. The trick was to give the metal just enough oxygen to satisfy the added light metals but not the silver. This was done by heat treating at about 400 degrees Centigrade in an atmosphere of pure hydrogen dried with concentrated sulfuric acid, leaving just a little water vapor, enough to allow selective oxidation of the lighter metals.

Before the film-protective methods were devised, extensive tests were made on over 100 alloys including many that had previously been thought to show promise but none of these showed any hopeful prospects. In smoky English kitchens, in rural, village and city sitting rooms, in other places where the atmosphere might be hard on silver, triplicate samples were placed for varying periods of time. The tarnish was measured by various methods, ranging from visual inspection to a precise electrochemical analysis, which dissects various constituents in the millionth of an inch tarnish film. This film was found to consist of not just silver sulfide, but also of silver sulfate, cuprous oxide, and cuprous sulfide, and the methods employed enabled these tarnish products to be quantitatively estimated.

May Resist Wear

The protective effect of these processes is astonishing so far as the prevention of tarnishing is concerned, but it is too early to speak with assurance on wear resistance, although the well known hardness and abrasion resistance of the oxides of aluminum and beryllium offer hopeful prospects.

Other metals may be protected by the selective oxidation method. The same principle has been applied to prevent the high temperature scaling of copper, an achievement that gives promise of industrial utilization.

The control of the methods by the Worshipful Company of Goldsmiths of London, a quasi-public survival of the old guild of workers in precious metals, will allow the industrial development of

the new process in such a way that there will be no monopoly by any one manufacturer. The experimenters feel that their novel scientific approach to the tarnishing problem has given very promising results, but that much remains to

be done to test the wear resistance and other properties of the protective films and to develop the treatment processes to simplify them for industrial application.

Science News Letter, October 29, 1938

PALEONTOLOGY

Human-Like Tracks in Stone Are Riddle to Scientists

They Can't Be Human Because They Are Much Too Old— But What Strange Biped Amphibian Can Have Made Them?

WHAT was it that lived 250 million years ago, and walked on its hind legs, and had feet like a man?

No, this isn't an ordinary riddle, with a pat answer waiting when you give it up.

It is a riddle of science, to which science has not yet found any answer. Not that science gives it up. Maybe the answer will be found some day, in a heap of broken and flattened fossil bones under a slab of sandstone.

But as yet all there is to see is a series of 12 foot-prints shaped strangely like those of human feet, each 9½ inches long and 6 inches wide across the widest part of the rather "sprangled-out" toes. The prints were found in a sandstone formation known to belong to the Coal Age, about 12 miles southeast of Berea, Ky., by Dr. Wilbur G. Burroughs, professor of geology at Berea College, and William Finnell.

Recently Prof. Burroughs was visited, in his laboratory by some Kentucky mountain men, who took him up into their hills and showed him another place where there were many of the footprints. This mountain site, indeed, seems to have been the "Old Kentucky Home" of a whole family of the mysterious animals, for Prof. Burroughs reports that the footprints "range in size from small ones about 4½ inches long to tracks the size I have written you about," which were nearly 10 inches in length.

Newest find of the mysterious footprints was made on a rock outcrop in a pasture near Festus, Mo., about 30 miles down river from St. Louis. Thomas L. Donnell, who found them, poured plaster of Paris into the prints to make casts. He sent the casts to Alfred Baily, director of the Colorado Museum of Natural History, who in turn forwarded them to Charles W. Gilmore, curator of

paleontology of the U. S. National Museum in Washington, D. C.

Mr. Gilmore states that some tracks like these, in sandstone of the same geological age, were found several years ago, in Pennsylvania. But neither in Pennsylvania, Missouri, nor Kentucky has there ever been found even one fossil bone of a creature that might have made the tracks.

Mr. Gilmore, searching old scientific publications, discovered that similar tracks had been found on the Missouri bank of the Mississippi river long before. In the American Journal of Science for 1822 there were letters to the editor by Henry R. Schoolcraft, noted early American scientist, and Senator Thomas H. Benton, telling of "human" footprints in the rocks along the waterfront at St. Louis. Mr. Schoolcraft added that these prints even then had long been known to the original French settlers of the city.

Human Size

The footprints are exceedingly curious things. They are the right size to be human—nine or ten inches in length—and they are almost the right shape. Practically everyone who sees them thinks at first they were made by human feet and it is almost impossible to persuade some people that they were not.

If the big toes were only a little bigger, and if the little toes didn't stick out nearly at a right angle to the axis of the foot, the tracks could easily pass for those of a man. But the boldest estimate of human presence on earth is only a million years—and these tracks are 250 times that old!

The highest known forms of life in the Coal Age were amphibians, animals related to frogs and salamanders.



THESE AREN'T HUMAN

But they look enough that way to fool almost everybody. They are footprints in sandstone, made ages ago by a still unknown animal in the late Coal Age. These prints are among those studied by Prof. W. C. Burroughs of Berea College, Ky.

If this was an amphibian it must have been a giant of its kind.

A further puzzling fact is the absence of any tracks of front feet. The tracks, apparently all of the hind feet of biped animals, are turned in all kinds of random directions. At Berea, two of them are side by side, as though one of the creatures had stood still for a moment.

A half-track vanishes under a projecting layer of iron oxide, into the sandstone.

So the riddle stands. A quarter of a billion years ago, this Whats-it That Walked Like a Man left footprints on widely scattered sands that time hardened into rock. Then he vanished. And now scientists are scratching their heads.

Science News Letter, October 29, 1938

MEDICINE

Human Cancer Transplanted Onto Rabbit Eyes for Study

Experiment May Determine Whether Protein Continues To Be Human or Takes on Rabbit Characteristics

CANCER from a woman's breast grafted successfully onto eyes of rabbits has opened new research vistas in the anti-cancer fight that make Rockefeller Institute for Medical Research scientists say frankly they have a new technique of "unlimited possibilities."

This may be the step toward solving the problems of cancer's cause, growth and immunity.

Dr. Harry S. N. Greene of the Rockefeller Institute laboratories announced to the scientific world (*Science*, Oct. 24) his success in transplantation of hu-

man cancer to animals.

"We hope to learn something about the specific nature of the protein involved in cancer," Dr. Greene said enthusiastically when interviewed by Science Service. "We want to know whether after the transfer the protein continues to be human or whether it takes on rabbit characteristics."

"If we can immunize a rabbit against human normal tissue and the transplanted cancer continues to grow, we will have taken a long step toward the understanding of cancer."

Dr. Greene made it clear that the present research is aimed at the cause and not directly at the cure of this dread disease.

Several other investigators in the past have claimed to have performed transplants from humans to animals but their work has not been widely accepted. In Dr. Greene's experiments, the human grafts took in 7 out of 12 rabbits. The human cancers have grown in the rabbits slowly but progressively for more than 80 days. Some of the cancers have multiplied themselves until they are five times original size.

Rabbit tumors have been transplanted onto the eyes of guinea pigs and serial transplants have been made by Dr. Greene through three generations.

Dr. Greene suggests that "it seems highly probable that human tissues can be maintained indefinitely in the foreign host."

Science News Letter, October 29, 1938

PHYSICS

New Cosmic Ray Studies Show Huge Bursts of Energy

TREMENDOUS bursts of atomic energy, caused when cosmic rays come down to earth, may scatter atomic debris over a room some 65 feet on a side, it is concluded in new cosmic ray studies (*Nature*, Oct. 15).

Physicists of the University of Manchester, Drs. L. Jánossy and A. C. B. Lovell, report studies in which they made cosmic ray bursts, or showers as they are called, take their own pictures in a cloud chamber. Only when cosmic ray particles set off "trigger" mechanisms placed over 15 feet apart were photographs of the tracks taken.

Some of the bursts of atomic catastrophe contained 30,000 separate tracks, they estimate. They conclude that the total energy of a single burst could be as high as 10,000,000,000,000,000 electron volts.

This energy, of 10,000 trillion electron volts, far surpasses any efforts of man to create high energy with machines.

The peak energy now obtained from atom smashing machines like cyclotrons is less than 15,000,000 electron volts. Even the great cyclotron now being built for Prof. E. O. Lawrence at the University of California will yield particles having energies of only 50,000,000 electron volts.

At 10,000 trillion electron volts, the cosmic ray energy is something like a billion times greater.

Science News Letter, October 29, 1938