

mate which was 40,000,000 degrees.

The number of atoms in the sun is 1,000,000,000,000,000,000,000,000 (ten to the 24th power) and the number of free electrons is at least as great.

The number of X-rays which constitute the internal radiant heat of the sun, total 20,600,000,000,000,000,000,000 (20,600 times ten to the 18th power). Sir Arthur believes that this number is correct within one per cent.

These X-rays are continually absorbed by the atoms and are emitted again and again. Thus energy is conserved and the sun has a long expectation of life.

Sir Arthur considers that it is possible that the sun consists of as much as 99.5 per cent. hydrogen but that a content of 35 per cent. is more probable. The recognition that a large proportion of hydrogen exists in the stars is considered by Sir Arthur to be the most important advance in stellar theory in the last seven years.

As to whether the sun or man-made high voltage can do the most damage to atoms, Sir Arthur is backing the high voltage developments now in progress of which the apparatus at Cambridge's Cavendish Laboratory is typical.

*Science News Letter, March 3, 1934*

#### GEOLOGY

### Yellowstone Park Has Great New Hot Pool

**Y**ELLOWSTONE National Park has a new pool, located in Midway Geyser Basin. Ranger Frank Child passed through the region late in January, and saw nothing unusual. But when he returned during the following week, the pool was there, about forty feet in diameter.

In being born it caused the dislocation of several tons of rock. Some of the dislocated rocks, now thirty feet distant from the pool, are estimated to weigh more than 600 pounds.

The new pool is very hot and very muddy. Violent boiling occasionally takes place on the north side. When this occurs a slight shock can be felt several feet from the edge.

It is located just east of the Black Diamond pool, from which it is separated by a narrow ledge of rock. The Black Diamond is about fourteen inches above the level of the new pool. A small stream of water flows from it to the new pool, and from the latter a stream six times as large in volume is flowing into the river.

*Science News Letter, March 3, 1934*

#### PHYSICS

## Americans Propose Theory Of Electron and Positron

**A** THEORY is a mere theory until something that it predicts actually happens. Because Prof. P. A. M. Dirac of Cambridge University, England, evolved a theory of the electron that foretold the existence of the positive electron (positron) which was discovered in cosmic ray crashes by Dr. Carl D. Anderson of Pasadena about 18 months ago, the Dirac formal mathematical symbolism received the intellectual homage of scientists. Incidentally, Prof. Dirac himself shared the Nobel prize for 1933.

Now, two Americans have offered a radically new theory of the electron and positron which goes beyond the Dirac theory and makes more predictions which scientists will proceed to test. Dr. W. H. Furry, a National Research Fellow, and Prof. J. R. Oppenheimer of the University of California present their theory in *Physical Review*, publication of the American Institute of Physics.

One consequence of the Furry-Oppenheimer theory is reminiscent of the famous Heisenberg principle of uncertainty. Roughly, that idea was that it was impossible to know just where a particle was and at the same time know just how fast it was going. The new theory states that the total energy of a system of particles in the presence of an external electro-magnetic field and the total charge and current density of such a system may be determined. But this can be done only at the expense of a precise knowledge of the number of electrons and positrons that are present in the system.

This means that the scientists can not determine with absolute precision the exact spot where cosmic or gamma rays create a pair of electrons. And this is something that scientists have wanted very much to know ever since Dr. Anderson's discovery of positron-electron twins born of cosmic ray smashes into matter.

Due to this necessarily incomplete knowledge, the physicists are forced to conclude that this creation of matter from energy, if such it be, occurs outside the nuclei of atoms. The intense electric fields of the nuclei have little

to do with energy-into-matter conversion, if the theory is correct.

One prediction of the new theory can be submitted to experimental checking. It is that if protons (hydrogen nuclei) are shot through an atmosphere of other protons they will suffer a scattering that differs from that which would be predicted by the old and usually reliable Coulomb law that "force is inversely proportional to the square of the distance between electrically charged particles." If this proves to be the case, the new theory will have gone through its first fire.

*Science News Letter, March 3, 1934*

#### BIOLOGY

### House Bill Restores Cuts in Research

**F**OUR IMPORTANT research activities in the Bureau of Biological Survey, which the Budget Bureau had scheduled for annihilation in 1934-35, have been restored in the Agricultural Department Appropriation bill reported to the House.

These are (1) Research on the food habits of birds and animals; (2) Migratory bird investigations; (3) Research on control methods for predatory animals; and (4) Researches on the production of fur-bearing animals.

Restoration of these items in the bill has added a total of \$142,803 for these lines of work.

*Science News Letter, March 3, 1934*

#### HISTORY OF SCIENCE

### CWA Worker Finds Copy Of "The New World"

**A** CWA worker, a library helper, has just brought to light an extremely rare and valuable work on America's discovery. It is a book written within twenty years after Columbus' death, printed in beautiful German type and bound in a wood cover shod with tooled leather.

It belongs to the Smithsonian Institution at Washington. Only two other copies are known to exist, and these also

belong to America, to libraries in Providence, R. I., and New York City. The volume, titled "The New World" and printed in Strassburg in 1534, is said to be almost unknown to research scholars.

English translation of the German work has been begun by Herbert Krieger, ethnologist of the Smithsonian staff. The German book is itself a translation of a work by Jean Huttich which appeared first in Latin two years earlier. When this new Latin volume, telling about the voyages of Columbus and other explorers appeared in 1532, it so interested the German, Michael Herr, that he had his friends read the Latin to him on winter evenings, and he wrote a German translation. Herr was a faithful and scholarly writer, with a pleasing German style, Mr. Krieger finds. His account checks well with known authorities on American exploration.

Herr describes Columbus as "a brave, big man with a long, red, freckled face"—not a heroic description, but one with a truthful ring. Herr gave more space than most historians to the cannibals of the New World, and to the island of women, Mr. Krieger has observed. The cannibals that Columbus met were Carib Indians, who were accustomed to swooping down on peaceful Arawak Indian farmers and carrying off victims for a feast. The island of women is thought to be Martinique. It was a sort of prison island where the Caribs held their captives for various purposes.

*Science News Letter, March 3, 1934*



**BRAVE, FRECKLED COLUMBUS**

*That is the description given by the rare volume in the young CWA worker's hands.*

ASTRONOMY

## 200-Inch Telescope Mirror To be Coated With Aluminum

### Unique Bombardment With Hearts of Matter Will Clean Quartz to Receive Layer of Best Light Reflecting Metal

**T**HE GREAT 200-inch telescope now being planned at Pasadena will be coated with an aluminum layer of high reflecting power instead of the silver that has been the standard material for many decades. The process for making such high quality mirror surfaces has been sought a long time but satisfactory results have been obtained only recently through experiments of Dr. J. Strong of the California Institute of Technology.

The first important trick involved is to get the surface to be vapor plated really clean. What is clean enough for silver plating is by no means satisfactory for aluminum. Dr. Strong blasts off the final contamination by a bombardment with electrons and ions.

The next puzzle was to find a suitable way of getting the aluminum to go where it was required. This is done by melting the aluminum on a tungsten wire of just the right size and shape. If the wire is too fine the molten aluminum will dissolve it and burn out. The wire in the form of a helix is heated until the aluminum evaporates and deposits on cooler surfaces nearby. This requires that the process take place in a high vacuum.

Dr. Strong has coated many small mirrors for instruments at the Mt. Wilson Observatory with great success. Aluminum has an enormous advantage in reflecting ultraviolet light. Silver and everything else so far used are very poor as reflectors in comparison. Because of silver's shortcomings, the reflecting type telescope was inefficient. Aluminum will reflect well all the light that gets through the atmosphere.

The aluminum coating can be "laundered." The aluminum surface develops an invisible coat of aluminum oxide which protects the metal without tarnishing like silver. It can be washed over and over with soap and water. It is thus not only much better but much more durable than silver which is now commonly used.

The biggest mirror so far coated is the 36-inch reflector of the University

of California's Lick Observatory on Mt. Hamilton, Calif. The coating was applied by Dr. Strong. It required a vacuum chamber big enough for several people to sit in. The chamber for the 200-inch diameter mirror (almost 17 feet across) will be gigantic by comparison but only technical difficulties are involved in its construction.

*Science News Letter, March 3, 1934*

ECONOMIC ZOOLOGY

## Mink and Silver Fox Farms Show Profit

**F**UR-FARMING—domestic cultivation of the silver fox and mink—has been on a fairly profitable basis for the past three years, reports F. G. Ashbrook of the Bureau of Biological Survey, U. S. Department of Agriculture. The Biological Survey is maintaining experimental fur farms, although its appropriations for the purpose are limited.

The stock-promotion phase of the fur-farming industry has now passed into Limbo, Mr. Ashbrook holds.

"It has been, during the last three years," I believe, "the one livestock enterprise that has actually given a profit," he said.

Fur farmers harvested 150,000 silver fox and 50,000 mink skins in 1933. The largest problem is to improve the pelts. Too many of them are inferior.

About thirty to thirty-five million dollars is invested in equipment and animals, buildings and runways.

Rabbit breeding is also conducted to a large extent on small farms, but largely for the purpose of selling the meat.

The fur trade uses more than 100,000,000 rabbit skins annually, but 98 per cent. of these come from Australia, New Zealand, Belgium, France, and other foreign countries.

The Congressional committee on appropriations restored \$51,717, which had been eliminated by the Budget Bureau, in order to have work on experimental fur farms continue.

*Science News Letter, March 3, 1934*