

come the "X" particles. The great mass of these secondary particles permits them to penetrate deeper than the initial particles and they are found to produce most of the cosmic effects found at sea level and low altitudes.

The new intermediate-weight particles, Dr. Langer reports, would account well for the cosmic ray effects noted in high altitude experiments on mountain tops, in airplanes and in sounding balloons.

It is not necessary to postulate new particles with special behavior to explain existing observations, as has been suggested by other investigators, says Dr. Langer.

He favors the hypothesis put forward by Dr. Seth Neddermeyer of California Institute of Technology, that there can exist a whole series of masses for the electron which differ by unity. Thus it would be possible to have electronic masses just as there is a whole series of chemical elements with masses differing by unity from hydrogen, at mass one, up to uranium with mass 240. In the field of the chemical elements only the form with mass 5 is missing out of all this series.

The still-unfound electrons with masses up to 10 times that of the ordinary electron, plus the very heavy electrons already observed, would provide the first successful explanation of the way cosmic radiation increases in intensity as one goes higher up in the atmosphere, claims Dr. Langer.

Science News Letter, April 2, 1938

METALLURGY

No Substitute Known For Metallurgical Coke

NOTHING now known can be substituted for metallurgical coke, despite the growing use of fuel oils and natural gas, reports Dr. Arno C. Fieldner, U. S. Bureau of Mines fuel expert, reviewing the state of the fuel industry in an address at the University of Maryland.

Coal, once supplying 89 per cent. of the country's fuel energy, and now giving 50 per cent., will in the future again supply most of our fuel energy, says Dr. Fieldner, for our coal reserves greatly exceed our petroleum reserves.

Gasoline from coal, ingenious though the Bergius and Fischer processes are, says Dr. Fieldner, is thermally inefficient, requiring four tons of coal to make one ton of gasoline. Thus, gasoline should not be made from coal until all natural supplies of petroleum are exhausted.

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FINDING EARTH'S AGE

Measurements of the amount of radium-derived helium in the rocks tell how old the rocks are, according to present geological theories. This complicated chemical apparatus, operated by Drs. William D. Urry (seated) and Charles S. Keevil (standing) is used in the extraction and measurement of helium from rocks.

GEOPHYSICS

Radium in Meteorites Helps Fix Age of Cosmic Visitors

EXPLODING atoms of radium, giving off helium, lead and energy, now tell scientists the ages of many meteorites which wandered into the earth's gravitational field, later crashing to earth with fiery brilliance.

Some of them, according to figures recently published by Dr. Wm. D. Urry, Massachusetts Institute of Technology physical chemist, who has been analyzing rocks for many years to determine their ages, are less than 100,000,000 years old, while others are as much as 2,800,000,000 years old—about as old as the solar system.

Dr. Urry's analyses, painstakingly made from samples of the meteorite, tell the age of its solidification, and not the time when it fell. Thus, some of these wanderers from space were molten during the age of dinosaurs on earth, while others solidified just as the solar system was being formed.

The oldest meteorites, according to

Dr. Urry's figures, could truly be "chips from creation" left over from the great mass of material pulled from the sun when the planets were formed. Others, unless they stayed melted for more than two billion years in the bitter cold of space, could not be leftovers. They must have been formed some other way.

Until recently, it was believed that meteorites were remains of a small planet, or group of planets, whose orbits were beyond Mars. This planet, on breaking up, created the meteorites. Now, with the ages of the meteorites shown to be different, the theory of a disrupted planet may need to be revised.

Many of the stony meteorites show evidence of having been broken and re-cemented, while others have undergone other alterations just as a rock on earth might in the course of its history. All of the rocks, however, are of the primary type—they were molten once, but none of them resemble earthly sedi-