3,400,000,000 Years Young

Geophysics

Old as our earth is, its age cannot be more than about 3,400,000,000 years. This is the conclusion reached by Sir Ernest Rutherford, famous British physicist and Nobel prize winner, and expressed in a communication to the British scientific journal, *Nature*.

It is reached from a study of photographs made by Dr. F. W. Aston, of the Cavendish Laboratory at Cambridge, with an instrument called the mass spectrograph. By means of this instrument it is possible to make photographs which show the weight of the atoms of many elements. Dr. Aston has shown, with its aid, that many elements consist of two or more separate kinds of stuff, with slightly different atomic weights, though they are all the same element. These different forms of the same element are called isotopes. Ordinary lead, for instance, consists of several such isotopes. One lead isotope is obtained as the final result of a series of elements into which radium disintegrates.

Dr. Aston has studied lead from a rare Norwegian mineral, called bröggerite, extracted for him by Dr. C. S. Piggot, of the Geophysical Laboratory of the Carnegie Institution of Washington. In his photographs he found a line showing the presence of lead of atomic weight 207. This, he concluded, cannot be ordinary lead. As there are three radioactive series, namely, radium, thorium and actinium, two of which break up into some kind of lead, he decided that the 207 isotope is the result of the break-up of actinium, of which less is known than of the other two series.

Sir Ernest, who is one of the greatest authorities on radium and its allied elements, states that Dr. Aston's conclusion is a reasonable one. Both radium and actinium are descendants of uranium, a well-known element. Sir Ernest believes that a form of uranium that he calls actino-uranium is one of the ancestors of actinium. Actino-uranium, he concludes, is present in ordinary uranium to the extent of about a quarter of a per cent.

"It is natural to suppose that the uranium in our earth has its origin in the sun," he says, "and has been decaying since the separation of the earth from the sun."

Because of the behavior of similar elements, he believes that the actino-uranium would be formed in the sun to a less extent than the main isotope. But even if it is supposed that they were formed in equal quantity, he says, it can be shown that it would only take about 3,400,000,000 years to bring it down to the twenty-eight hundredths of one per cent. in which it is present today.

"If we suppose that the production of uranium in the earth ceased as soon as the earth separated from the sun," he continues, "it follows that the earth cannot be older than 3,400,000,000 years."

Other studies of radioactive minerals have shown that some of them must have an age of at least half this figure, so that his calculations give students of the earth's early history both a maximum and a minimum for its age.

Sir Ernest also cites Sir James Jeans, British astronomer, who gives a figure for the age of the sun as 7,000,000,000,000 years. If the earth separated from it 3,400,000,000 years ago, the sun had then reached the rather respectable age of 6,996,600,000,000 years. The time since is scarcely more than a moment in the sun's history.

However, if the actino-uranium could only have been formed under special conditions in the sun when it was very young, it would have all disappeared when the earth was born.

"We may thus conclude," remarks Sir Ernest, "I think with some confidence, that the process of production of elements like uranium was certainly taking place in the sun 4,000,000,000 years ago and probably still continues today."

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It is more difficult to lay cables in the Pacific than in the Atlantic, because of the deeper ocean bed and the greater distances between land.

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