Age Of Solar System Hinted From Analysis Of Rare Earths

By SHIRLEY JONES

A Rice nuclear astrophysicist has determined the age of some elements to be approximately three times the age of our solar system.

By inference, the age of the Milky Way galaxy can be estimated as ten to fifteen billion years old.

DR. DONALD D. CLAYTON, of the new Space Science Department according to present theory, primordial "hydrogen hurricanes" were responsible for shaping the galactic "island universes."

The rotating planar cloud that was to form our galaxy flew apart. Some large pieces were not massive enough to form stars, but they did coalesce into solids.

When the nuclei of lighter elements captured neutrons and then emitted beta particles, many isotopes of these heavy elements were radioactive and therefore decayed into other forms. Until recently scientists had no idea how to determine what amount of an isotope was formed billions of years ago and what amount was formed relatively recently through decay.

As SOLAR nebulae began to condense, many solids were formed to exist today. After complicated "chemical vicissitudes," the abundance ratios may have changed greatly, except for elements with very similar physical and chemical properties. One such pair of virtual twin sister elements is Rhenum and Osmium, which also happen to have a pair of "mother-daughter" isotopes.

Dr. Clayton deduced that the special properties of this "fortuitous pair" could be used to determine how much Osmium-187 is made from Rhenum-187, and how much is made in stellar interiors. The relative abundances of Osmium-187 and Osmium-186 would originally have been in inverse proportion to their neutron-capture cross-sections.

THIS MEANS that there would have been 40 per cent as much Osmium-187 as Osmium-186. However, the amounts of these two isotopes are equal. Because the only beta-decay which produces Osmium-187 is that of Rhenum-187, 60 per cent of the Osmium-187 today was produced by Rhenum decay.

The half-life of Rhenum-187 is about forty billion years. Although it has not yet existed for even one half-life, Dr. Clayton has been able to compute that 12 per cent of the Rhenum-187 decayed since it was made and before our solar system was formed. Generally, scientists of today can precisely gauge time over an interval of a tenth of a half-life to an interval of ten half-lives.

DR. CLAYTON'S method of dating the formation of elements is not the only one, and in fact it gives roughly the same results as other techniques. When it has been perfected, however, it should give more accurate answers.

More work is necessary to determine specifically what is the rate of Rhenum-187 decay. Oak Ridge laboratories are helping on a second phase: finding out more exactly the neutron-capture cross-sections.

Dr. Clayton closed the conference with the following remarks: "I do not take sides on the cosmological question of the origin of the universe. I tend to like the steady state theory, but there is not enough evidence yet to judge. The proposed Orbiting Astronomical Observatory will provide data that may give us the answer."