

Cleveland and Darlington Astronomical Society
Minutes of Ordinary Meeting held on Friday 8 April 2011 at 1930hrs
in Wynyard Woodland Park Planetarium

Chairman Barry Hetherington opened the meeting at 1935 hours.

1. Notices

- i) Ed Restall announced that changes to the operation of the Planetarium had been implemented. It is expected that the Planetarium will continue to be available to the Society for another year.
- ii) Neil handed out two new member's packs. The next meeting will be on 13 May. Roger Pickard, Vice President of the BAA and Director of the Variable Star Section, will be talking on "Variable Stars".

2 Lecture for the evening: Dr David Jenkins, "Cauldrons of the Cosmos"

The question Dr Jenkins was addressing tonight was, "Where do all the chemical elements come from?" The first questions about what we and the Earth are made of were probably asked from the beginnings of human intelligence. The Greeks answered it with their earth/fire/water theory. In the 19th century the chemical elements were being discovered and the ubiquitous Periodic Table of the 92 elements was published by Mendeleev.

Why are the abundances of the chemical elements as they are – for example, there is a lot of iron but gold is very rare? Elements other than hydrogen, helium and a bit of lithium were not present immediately after the Big Bang, so the others must have been produced later in the history of the Universe. The answer lies in the very tiny nucleus of the atom.

Alchemists, trying to turn base metal into gold, were using chemistry, which cannot produce new elements. Changing the constituents of nuclei requires much greater energies than they had available. Conditions for the fusion of nuclei together exist at the centre of stars. At millions of degrees, elements up to number 26, iron, can be produced. So what about the elements with atomic numbers from 27 to 92?

This requires the huge energies generated by supernovae. Models have now been developed that show in detail the generation of many elements, some of which are unstable and decay to the distribution we observe.

A question session followed, which included:

- There must have been a supernova very near to our Solar System before it was formed? *Yes, that's right. There had been 10 billion years available to have lots of supernovae before the Solar System formed.*
- The Earth's magnetic field is produced by circulating iron, but there is no iron on the Sun, so why are there still very strong magnetic fields? *Any circulating ions will produce magnetic fields, and the Sun has lots of hydrogen ions to do the job.*
- What is the heaviest element ever to have been produced? *Number 126 has been made on Earth, as the heaviest stable element.*

3. Vote of thanks and closure of the meeting

The Chairman proposed a vote of thanks to Dr Jenkins and drew the meeting to a close at 2035.

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