Meetings

Ordinary Meeting and Christmas Lecture, 2001 January 6

held at the Scientific Societies' Lecture Theatre, 23 Savile Row, London W1

Dr Nick Hewitt, President
Ron Johnson, Nick James & Owen Brazell, Secretaries

The third meeting of the 111th session was held at 23 Savile Row on 2001 January 6, following the second annual Christmas lunch. The President, in the Chair, started by thanking the caterers for a superb meal, to much applause from the audience. The audience then stood in silence as a mark of respect for George Alcock, described by Dr Hewitt as one of the 'greatest of all English observers' who died in December. This was followed by the more welcome news that Dr Patrick Moore had been granted a knighthood in the New Year’s Honours list, which was greeted with applause.

Mr Brazell read the minutes of the meeting of 2000 November 29, which were approved by the audience and signed by the President.

invited him to deliver the Christmas Lecture for 2000.

Making a lens in the Sun

Professor Gough explained that the study of the Sun could provide a laboratory. Examples include two 'frontier' examples: gas behaviour at high temperature and pressure, which might provide valuable insights for those working on the possibility of fusion power, and the fundamental particle physics exemplified by the 40-year search for the mass of the neutrino. The most common method of solar observation was simply to 'listen'; the science of helioseismology. Despite the limited coverage (only half of the sphere at one time) the data received was equivalent to placing 500,000 seismographs across the Earth.

The speaker then presented an overview of the structure and recent observations of the Sun. In extreme UV, the magnetic field's destructive effect on the symmetry of the star is obvious and this is where most research effort is directed. Quoting van de Hulst, however, Prof. Gough recommended looking beneath these distractions to gain an understanding of the deeper structure. The method of doing this is to look for Doppler shifts on a local scale representing local disturbances from the mean. (At this point, a buzzer on a rope was swung above the audience, demonstrating the Doppler effect to much applause). From these techniques many interesting results have been obtained. For example, the centre of the Sun is now known to be very smooth & isothermal; in fact, more uniform in temperature than the air in the lecture theatre. The next advance in technique is to use what is effectively the science of acoustics.

The speaker then gave a basic introduction to the theory of refraction and optics. Things in the Sun are, however, complicated by myriad reflections off complex layers which have been disturbed by the prevailing magnetic field. This was demonstrated by the reflection of light from a torch held by the President off a sheet of crumpled foil. However, these reflections provide a method of learning about the material which is reflecting the waves. For example for most materials at room temperature and pressure, a 'perfect' gas law is followed, in which the size of atoms is assumed to be zero (they are treated as points). At higher temperatures, however, the fundamental limit in separation between atoms becomes involved and the relationship between pressure and temperature changes. These changes influence their neighbouring atoms and electrons can move from one to another; in other words, the Sun is an electrical conductor. Professor Gough then showed predictions and data for the change in speed with depth. Once the effect described above of a finite size molecule is incorporated, agreement is good and can explain most of the convection effects seen.

To conclude the talk, the speaker went on to outline a less successful area of research – that of the 'neutrino problem'. In order to resolve the deficiency in observations of neutrinos compared to theoretical predictions, it was hoped to examine the relevant areas deep within the Sun using the same techniques. However, the bending of the light is too extreme to be corrected easily. However, like the Hubble Space Telescope, once the exact nature of the flaw (in this case the bending of light) is understood then it should be possible to optically correct. This was described as a 'great challenge', but a glimmer of hope was provided by recent research, published in 2000, which produced an image of the far side of the Sun, including a major spot group which had previously been observed on the near side (on 1998 April 8). Professor Gough ended his talk to much applause with the belief that 'if it can be seen today, we can measure it tomorrow'.

Following questions from the audience and a break for tea, the President introduced Ann Davies and David Boyd from Newbury Astronomical Society.

Taking astronomy to children

The project began after Ann and David attended a talk at a PAS convention on Astronomy in the National Curriculum. Initially, £1000 sponsorship was obtained, together with help from the Rutherford-Appleton Laboratory to arrange a day called 'Stars and Space' which included many attractions, including an inflatable planetarium and an emphasis on hands-on features. This was arranged to correspond with the first National Science Week. The speakers were keen to emphasise the importance of

Mr James said that the following papers had been accepted for publication in the Journal:

A history of the RAA in Australia and the fate of its branches, by Wayne Orchiston
Galileo's measurements of the diameter of a star and the eye's pupil, by David W. Hughes
Observations of (433) Eros in 1975 and 1981/82
and Observations of (4) Vesta between 1989 and 1996 by Andrew J. Hollis

Mr Johnson announced that no presents had been received this month. Dr Hewitt said there were 12 new members for proposal, and that 11 new members proposed at the last meeting had been elected this morning subject to confirmation. The members confirmed their election, and the President said he hoped that any new members who were here today would come to meet him during the tea break.

Preliminaries over, the President introduced Professor Douglas Gough from the Institute of Astronomy in Cambridge, and

Christmas Lecturer 2000, Prof. Douglas Gough. (Photo: Hazel McGee, with thanks to Pat Elliott)