

Report of 16 June 2016 Meeting

Royal Society

Southern Highlands Branch

Speaker: Dr Ken McCracken

Topic: The Sun, Sunspots and Space Weather

The Southern Highlands Branch of the Royal Society was extremely fortunate to have as speaker for the June meeting Dr Ken McCracken who had returned only days before from his ongoing projects in Europe. This world renowned scientist is a most humble, yet highly entertaining speaker who resides in the Southern Highlands, so it was no surprise that eighty people were drawn to hear him deliver updates from his previous presentations and findings.

Until recently, all of our information about solar flares, sunspots, etc has come from telescopes on Earth or from satellites orbiting Earth. As a result, scientists have been able to achieve only a 2-dimensional understanding of these phenomena. To overcome this limitation, STEREO (Solar Terrestrial Relations Observatory) spacecraft were launched a decade ago with the introduction of new technology. The long lives of the two stereo spacecraft, now nine years old, have been a boon for scientists studying the Sun and its influence throughout the solar system. The two STEREOs slowly drifted away from Earth as they orbited the Sun, one ahead and one behind our home planet, giving scientists constantly improving views of the Sun's far side, allowing us for the first time to see the whole Sun at once.

This research is extremely important because conditions on the Sun and in the solar wind, magnetosphere, ionosphere and thermosphere can influence the performance of space-borne and ground-based technological systems, and can endanger human life or health. Major economic and legal implications can arise from radiation exposure to pilots, astronauts and perhaps airline passengers. The shut-down of national electricity grids is also a serious possibility, with the frightening prospect of losses in the order of two trillion dollars according to US estimates. The commercial lifetime of satellites may be appreciably shortened by conditions emanating from the Sun, to say nothing of the threat of disruption of radio communication and perhaps the accuracy of GPS.

McCracken went on to present likely advances in space weather research for the future. He spoke in some detail about planning which is now in place for sentinel satellites to be located at Lagrange points, or stationary points, where the forces on a satellite would be zero in the rotating reference frame. For any two massive bodies such as the Sun and the Earth which rotate about their centre of mass, there exist five such stationary points. Debate is currently raging in scientific circles about which two of the Lagrange points should be chosen for satellite location to optimize data collection in this very expensive project. Ken McCracken is hoping for one of the satellites to be located at the Lagrangian

point known as L5, where conditions at the back of the sun would be used to predict what would soon happen on Earth.

In closing, McCracken reminded his audience that the sun continues to decline in activity and that this decline may continue for from 20 to 100 years. He said that the Earth will cool – maybe a little – maybe a lot. Then it will heat up again.

He also expressed his opinion that the new science of space weather leading to the introduction of STEREO satellites has revolutionized solar physics.

An exciting lecture.

Anne Wood