Report of 15 March 2018 Meeting
Royal Society
Southern Highlands Branch

Speaker: **Dr Bradley Tucker**
Research School of Astronomy and Astrophysics, Mt Stromlo Observatory, ANU

Topic: **Exploding Stars, Dark Energy, and the End of the Universe.**

This exciting speaker attracted an audience of 58 in the Joadja/Nattai conference room at the Mittagong RSL on Wednesday 15 March. Professor Tucker mentioned in his opening address that much of the work he was about to present may be seen by some as a special tribute to Professor Steven Hawking who had passed away the day before. Hawking's theories had set a profoundly solid base for all astrophysicists for many years to come, and Tucker added that no lecture such as this could be complete without frequent reference to the relationship between space and time as described by that outstanding scientist.

Bradley Tucker received degrees in Physics, Philosophy and Theology from the University of Notre Dame before undertaking a PhD at Mt Stromlo Observatory at ANU, working with Nobel Laureate Brian Schmidt. He is currently working on projects trying to discover the true nature of dark energy which makes up 70% of the Universe. He is also the lead of the Kepler Extra-Galactic Survey, a program to understand why and how stars blow up. In addition, he is leading a project to build a network of ultraviolet telescopes in the upper atmosphere, these telescopes being built at Mt Stromlo.

The research of astronomers and astrophysicists to explore the expanding nature of the Universe has been based in recent years on observations of the most powerful explosions in the cosmos, the exploding stars known as supernovae. From this data, it was found by Brian Schmidt and his team several years ago that the expansion of the Universe is not just happening, but is occurring at an accelerating rate due to dark energy which will cause the end of the Universe.

In this lecture, Dr Bradley Tucker described in detail the characteristics of different supernovae resulting from the particular ways that a star had exploded. The energy emanating from one supernova is equivalent to that from 100 million billion billion billion (100 decillion) lightning bolts. These massive bursts briefly outshine all the light from the galaxy wherein they occur. The past 15 years has been a "boom" period for supernovae, with vast amounts of time and effort being invested in these objects. Not only are they important for understanding the life of stars, they can be used as cosmological probes to study what the Universe is made of and how it is growing. In this wide-ranging lecture, Dr Tucker showed in detail how supernovae are found, and how to identify different types. He discussed how to find supernova progenitors, and then

described, among others, core-collapse supernovae, and the shockwaves resulting from them.

At the conclusion of the lecture, and during question time, there was a great deal of robust discussion with the speaker as the large audience pondered the ultimate fate of the Universe. Dr Tucker raised the possibility that at the time of the *Big Bang* approximately 14 billion years ago, our Universe was formed at the same time that a previous Universe was passing into history. A memorable and challenging lecture.

Anne Wood FRSN