

## Australian Institute of Physics NSW Branch (July News)

The July meeting of the NSW branch of the AIP was held at the University of Sydney on Tuesday 28 July 2009 and featured a public talk by Dr Zdenka Kunic. Zdenka is currently Senior Lecturer at the School of Physics, University of Sydney, and coordinator for the postgraduate industry training initiative in Medical Physics.

Zdenka's research interests include space plasma physics, theoretical astrophysics and radiation physics. Zdenka is also actively involved in cross-disciplinary research and has been transferring her expertise in radiation transport modeling in particular from high-energy astrophysics to medical physics applications, such as radiation dosimetry, radiation therapy and radiation biophysics.

Dr Kunic explained that astronomy and medicine share many similar demands for increasingly sophisticated and diverse imaging techniques as well as associated cutting-edge instrumentation technologies and advanced software tools for multi-dimensional data storage, manipulation and processing.

Dr Kunic started the talk by comparing imaging in medicine and astronomy. In Medicine a radiation source such as X-rays mostly pass through bones leaving a shadow on a photon sensitive film (detector). The resulting image will be studied and a course of therapy may be undertaken. In Astronomy a similar process occurs where energetic photons from a far away source such as a galaxy passes through a number of intervening mediums (such as dust and gas) to land on a another type of detector on earth where an analysis is done.

Dr Kunic then went on to link both astronomy and medicine in a historical context. It was once believed that body functions, the contraction of diseases etc., were influenced by the sun, moon, planets and signs of the Zodiac. One could argue that the genesis of medical imaging began with Leonardo da Vinci when he studied human physiology - drawing detailed diagrams of bones in a number of body parts such as arms, after having completed his own dissections. Soon after, Copernicus, who was an astronomer and physician, completed many studies in both fields. Galileo also studied medicine before changing to astronomy. A well-known Australian scientist, Ronald Bracewell (1921 - 2007) worked in radio astronomy and may be best known for his imaging work including converting 2D images into 3D images. A major part of his work also entailed imaging applications in astronomy and medicine.



Photo: From left to right, Dr Fred Osman (AIP Branch Chair), Dr Zdenka Kunic and Dr Scott Martin (AIP Deputy Branch Chair).

Dr Kunic also talked about a number of other connections between astronomy and medicine such as using similar imaging techniques. Astronomy uses interferometry, direct photon detection and spectral imaging, with medicine using CT, magnetic resonance and ultrasound. There is also much common ground in data handling and analysis. Astronomy uses detection, verification and interpretation of spectral data, with medicine using a similar detector and accelerator verification, with a calculation of absorbed dose. Astronomy and medicine come closely together in space radiation dosimetry.

Dr Kunic concluded by emphasizing the opportunities for knowledge and technology transfer across the two disciplines. This cross-disciplinary research initiative in Astronomy and Medicine is currently being established at the School of Physics, University of Sydney.

Overall, Dr Kunic's varied background put her in an excellent position to provide an entertaining and unique talk that successfully linked astronomy with medical physics in many areas and was well received by the well-attended audience. We enjoyed further conversation into these areas and others afterwards at a nearby Italian restaurant. The Australian Institute of Physics thanks Dr Kunic for her outstanding lecture!

**Dr Graeme Melville – AIP NSW Branch Secretary**