Report of 16 April 2015 Meeting
Royal Society
Southern Highlands Branch

Speaker: **Professor Richard Banati**
Biomedical Scientist, ANSTO Life sciences

Topic: **Welcome to the age of the Plastic – Sea**

ANSTO scientists have used ground-breaking nuclear research techniques to measure the elemental composition of plastics at the atomic level as they degrade in the environment. Professor Richard Bananti delivered an exciting lecture on the research he has been conducting on this subject in conjunction with scientists from Monash University and the University of Tasmania.

To demonstrate the sensitivity and sophistication of these new nuclear research techniques, Banati chose the analogy of tipping a 150ml glass of wine into the 500,000,000,000 litres of Sydney Harbour, and subsequently accurately determining the type of wine from a small sample of the Harbour water! The 52 person audience instantly had an appreciation of the ability of the new techniques to identify traces and fingerprints of certain plastics in ocean going birds and marine life. The analyses that Banati and his team used to trace the molecular composition of various plastics were conducted at the Synchrotron in Melbourne.

The seabird that the team used for their study was the flesh footed shearwater. It was found that the chicks can have substantial amounts of plastics in their stomachs, in some cases up to 10% of their body weight. The chicks are fed by their parents with coloured plastics that they have mistaken for prey. ANSTO scientists have studied the trace elements that are typically found in plastic and in the stomachs of the birds. In an astonishing breakthrough, they have also found the same elements in the feathers of the shearwater, demonstrated by patterns in the growth of chicks' feathers, not unlike the patterns seen in the annual growth rings in a tree. This data is a clear indication of the effects of degrading plastics on the food chain.

Quite a deal of Banati's lecture concentrated on the plastics themselves, and the possibilities of identifying their sources of manufacture, and the contamination they cause, using the latest nuclear research techniques. Estimates suggest that the planet could have another 33 billion tonnes of plastic by 2050. This amount of plastic, 33 billion tonnes, is equivalent to filling 2.75 billion garbage trucks, enough to wrap around our planet 800 times if lined up end to end.

Banati posed the question of whether in the future, manufacturers/distributors could be required to place certain atomic markers in their plastics, so that the fingerprint of the plastic and hence its origin, could be readily identified using the latest nuclear analysis

methods. A simple example could involve the manufacturer introducing only 10mg of gold to 1000kg of plastic at the manufacture stage to allow the whole issue of product life cycle analysis to be fully examined.

It was made clear to the audience that, despite the discussion that had just been presented, the great benefits of plastic should never be underestimated. However, there is still much work to be done in the field of plastics. It is complicated by factors such as lightweight packaging plastics that cannot be recyled being compared with heavyweight ones that can, sustainability issues, biodegradability effects, and general ignorance in the industry about what to do with packaging materials when they become waste.

Policies for managing plastic debris are clearly outdated, but it must be hoped that change will soon be in the air, now that Banati and his team have such exquisite analytical tools at their fingertips.

Anne Wood