

## Scientific highlights

In a PN Symposium the first question is always “what is a PN”? In his review, Frew presented the mimics problem, and how to try to solve it, to obtain pure sets of PNe.

All PN scientists know that PNe are ideal tools in many fields. Delgado-Inglada showed that they can be used to measure oxygen enrichment, while iron in PNe is still controversial and probably mostly not in gaseous state. Neutron-capture elements were reviewed by Sterling and Dinerstein as well.

PNe are the relics of AGB evolution. Lugaro and dell’Agli gave excellent talks on this field, including the major chemical signatures of low and high mass progenitors, and the influence of dust in stellar evolution. The future of data to model comparison will rely in the future on the new initial mass – final mass relation, as presented by Cummings. New stellar modeling that lead to PNe have been presented by Bertolami, whose talk made the audience very excited for the new possibilities offered by the apparently faster post-AGB evolution, but also weary for possible strong initial assumptions that may affect the models to data comparison.

Molecules and dust were discussed by several speakers, including Cami, whom firstly discovered fullerenes in a celestial object, a PN, a few years ago. This is a field that has greatly developed since last symposium, with many new interesting connections and ramifications. Molecular transitions have recently been used to determine the highest spatial resolution image of a PN currently available, which has been shown in a stunning image, presented by Manchado.

Planets secluded in PNe is a very recent field of exploration. Talks by Villaver and Boyle focused on the shaping of the PN in the presence of a planetary companion. Stellar companions, instead, have been studied for quite some time in order to explain the PN morphologies. De Marco, Nordhaus, and others explored the latest news from the field of asymmetric PNe.

Going back to PNe as probes, in the recent years PNe have been used, together with HII regions, to study the chemical evolution of external galaxies. Molla, and Bresolin, presented the theoretical and observational views of these fields, which see in much expansion at this time, in the era of the large galactic surveys such as CALIFA and MANGA.

PNe in external galaxies as probes of their chemical populations and evolution (Balick), and are also dynamical probes (Arnaboldi, Coccato). The new data sets are really amazing, and the possible future exploitation of the 30m class telescopes in this particular field seem endlessly exciting.

This is the year of the first data release from GAIA. Several talks (Manteiga, Stanghellini, Walton) described the initial results from these data. PN parallaxes are still very few, and the uncertainties high, to be able to discuss a group of PNe based on their GAIA distances, but the field is extremely promising, both in the PN structure and evolution studies, and on the PN distance scale.