

Workshop “Observational and Theoretical Astrophysics”

October 27, 2011

Center for Planetary Science (CPS), Kobe University

1:30 – 3:00 pm Henri Boffin (ESO, Chile) :

Talk 1: When asymmetric cosmic bubbles betray a difficult marriage: the study  
of binary central stars of Planetary Nebulae

Talk 2: The mass ratio distribution of binary stars

3:00 – 3:15 pm Coffee Break

3:15 – 4:00 pm Takuya Matsuda (NPO “Einstein” ) :

Boltzmann Particle Hydrodynamics

4:00 – 4:45 pm Takayuki Muranushi (Kyoto Univ.) :

“Paraiso” project – an automated generation and tuning of explicit partial  
differential equations solvers –

4:45 – 5:00 pm Coffee Break

5:00 – 5:30 pm Hiromu Isaka (Shimazu Co.) :

An Engineering Application of BPH Method

5:30 – 6:00 pm Hiroshi Koyama (K-Computer, RIKEN) :

TBA

7:00 – 9:00 pm Welcome & Farewell Party for Dr. Boffin  
in Sannomiya

## Abstracts

Henri M.J. Boffin (ESO, Chile)

Talk 1: When asymmetric cosmic bubbles betray a difficult marriage: the study of binary central stars of Planetary Nebulae.

Planetary Nebulae represent a powerful window into the evolution of low-intermediate mass stars that have undergone extensive mass-loss. The nebula manifests itself in an extremely wide variety of shapes, but exactly how the mass lost is shaped into such a diverse range of morphologies is still highly uncertain despite over thirty years of vigorous debate. The most natural explanation involves the presence of a couple of stars at the centre of the Planetary Nebula, and it is their dramatic interaction that leads to the magnificent showcases. Notwithstanding their interest per se, the known close binary central stars of Planetary Nebulae (CSPN) are also important to study as they constitute the likely progenitors of cataclysmic variables, post-CE white dwarf main-sequence binaries, and, perhaps, Type Ia supernovae. I will provide an overview of why such binary CSPN offer a rich, untapped pool of objects “just out of the oven” to study the late stages of binary stellar evolution, and in particular, the very poorly known common-envelope interaction, and give a few examples of systems of interest our team is currently studying. With these observations, we may be witnessing a paradigm shift that will perhaps lead to the discovery that only binary stars form planetary nebulae.

Talk 2: The mass ratio distribution of binary stars.

The forthcoming large surveys – including GAIA - will provide us with an amazingly large set of new binaries. Most of these will be single-lined spectroscopic binaries (SB1) - including exoplanets - for which, because of the unknown inclination angle, we will unfortunately not have a direct knowledge on the masses of the components, an essential ingredient to apprehend the evolution of these systems and understand the various mass transfer mechanisms. Fortunately, statistical methods allow us to derive the mass ratio distribution of large samples of SB1 (and in the case of planets, on the planet mass distribution), and so obtain some insight in the properties of these systems. I will show how these methods have already been applied to a wide range of different binaries and how they will prove extremely useful in the future.