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Planets around evolved stars

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Since Nicolaus Copernicus proposed for the first time the model of the Solar System, it has taken nearly 450 yr to detect the first planet around stars other than the Sun (Wolszczan & Frail 1992; Mayor & Queloz 1995; Marcy & Butler 1996). The progress has been much faster since, and the first multiple planetary system orbiting a main-sequence (MS) star was found only a few years later by Butler et al. (1999). Today, the focus of most planet searches is on MS stars with planets in stable habitable zones (HZ). From a list of almost 3000 exoplanet candidates, 20 are potentially habitable, including the first Earth-like planet (Gliese 581 d – Udry et al. 2007).

Stars beyond the MS are frequently avoided in planet searches because they are known to exhibit various types of variability: RV variations of unknown origin were pointed out to be common in red giants (RGs) by Walker et al. (1989), and multiple pulsation modes are often present. In addition, the rotation of starspots across the stellar disk can affect the spectral line profiles of these stars (Vogt et al. 1987; Walker et al. 1992; Saar & Donahue 1997). However, soon after the first discovery (*t* Dra b Frink et al. 2002), searches for planets around stars beyond the MS have become recognized as important in building a complete picture of planet formation and evolution for several reasons. First, they allow extending the reach of the most versatile RV technique, which is not applicable on the MS because of the high effective temperature of the stars and their fast rotation rates, to objects with masses significantly higher than solar (e.g., *o* UMa, a 3 M_{\odot} giant with a planet – Sato et al. 2012). Second, the planetary systems around evolved stars are much older than those around MS stars, and therefore they are suitable for long-term dynamical stability considerations. Planetary systems around giants are also subject to changes induced by stellar evolution, and therefore are suitable for studies of star – planet interactions, and last but not least, evolved planetary systems carry information on the initial population of planetary systems to be found around white dwarfs. It is no surprise then that several projects devoted to searches for RV planets that orbit RGs were launched. One of the largest of them is the PennState – Toruń Centre for Astronomy Planet Search (PTPS, Niedzielski et al. 2007; Niedzielski & Wolszczan 2008a,b).

In my talk I will present the sample of PTPS, current status of our planet search and the most recent discoveries. I will also discuss some properties of the exoplanets around evolved stars from the PTPS perspective.

Serdecznie zapraszam,
Agnieszka Majczyna