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MASSIVE STAR STUDIES WITH THE CHARA ARRAY

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Georgia State University operates the Center for High Angular Resolution Astronomy (CHARA) Array at the Mount Wilson Observatory in southern California. This optical/IR interferometer consists of six 1 m telescopes in a *Y*-shaped configuration. The Array uses three IR and two visible wavelength beam combiners that are optimized in different ways for visibility, spectral resolution, and number of telescope pairs. We describe observational programs underway on OB-stars, Be stars, and binary/multiple systems.

The CHARA Array interferometer has 15 baselines from 30 to 330 m (the world's longest operational baseline). CHARA operates in two wavelength regimes, 470–800 nm (resolution of 0.15 mas) and 1.2–2.5 microns (resolution of 0.6 mas). Routine visibility measurements began in 2005, and the first imaging observations came in 2007. CHARA currently operates five beam-combiners: Classic (high sensitivity, two-telescope, JHK-bands; ten Brummelaar et al. 2005), FLUOR (precise visibility, two-telescope, K-band; Coudé du Foresto et al. 2003), VEGA (high spectral resolution, two-telescope, VR-bands; Mourard et al. 2008), MIRC (precise closure phase, four-telescope, HK-bands; Monnier et al. 2008), and PAVO (high sensitivity, three telescope, RI-bands; Ireland et al. 2008).

The first scientific paper from CHARA described the rotational distortion of Regulus (McAlister et al. 2005), and several studies have followed on the geometry and gravitational darkening of rapid rotators (including the first image from MIRC of a main sequence star, Altair; Monnier et al. 2007 and Zhao et al. this volume). Angular diameter measurements are critical for the determination of stellar effective temperature, and Boyajian (GSU) is completing her dissertation on the diameters, radii, and temperatures of nearby A-, F-, and G-type stars. Richardson (GSU) and Ireland (Sydney Univ.) are using PAVO to determine angular sizes of nearby B-stars (including some Pleiades members), O-supergiants in Orion, and the runaway O-star, ζ Oph.

Interferometry is particularly important for the study of the size, shape, and time evolution of the outflowing disks surrounding rapidly rotating, Be stars (Tycner this volume). Be star disks radiate emission lines (Hα) and produce an IR-excess (free-free emission). Gies et al. (2007) obtained the first K-band observations of the northern Be stars γ Cas, ϕ Per, ζ Tau, and κ Dra. The disk continuum radiation was resolved in each case, and simple power law models of the disk density were constructed to match the observations. Schaefer et al. (this volume) are making the first H-band images of ζ Tau through multiple-year observations with MIRC. Touhami et al. (this volume) are surveying the K-band emission of 21 Be stars using Classic, MIRC, and FLUOR.

A number of programs of interferometric observations are underway to obtain the masses and distances of massive binary and multiple stars. For example, Aufdenberg et al. (2009) is using measurements from CHARA and the Sydney University Stellar Interferometer to determine the fundamental parameters of the Spica system in order to test internal structure models for apsidal motion. A number of multiple systems containing massive stars are being investigated by O'Brien (GSU; including η Ori and ι Ori) and by Gies, Schaefer, and ten Brummelaar (GSU; including σ Ori, 15 Mon, and CHARA 96 = HD 193322). Zhao et al. (2008) presented the first images of an interacting binary, β Lyr, that show both the tidally distorted shape of the mass donor and a thick disk encompassing the hidden mass gainer. These early results show the unprecented power of interferometry to probe the mass transfer properties of close binaries.

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