

## Gemini spectroscopy of the outer disk star cluster BH176

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### Abstract

© ESO, 2014. Context. BH176 is an old metal-rich star cluster. It is spatially and kinematically consistent with belonging to the Monoceros Ring. It is larger in size and more distant from the Galactic plane than typical open clusters, and it does not belong to the Galactic bulge. Aims. Our aim is to determine the origin of this unique object by accurately determining its distance, metallicity, and age. The best way to reach this goal is to combine spectroscopic and photometric methods. Methods. We present medium-resolution observations of red clump and red giant branch stars in BH176 obtained with the Gemini South Multi-Object Spectrograph. We derive radial velocities, metallicities, effective temperatures, and surface gravities of the observed stars and use these parameters to distinguish member stars from field objects. Results. We determine the following parameters for BH176:  $V_h = 0 \pm 15$  km s<sup>-1</sup>,  $[Fe/H] = -0.1 \pm 0.1$ , age  $7 \pm 0.5$  Gyr,  $E(V - I) = 0.79 \pm 0.03$ , distance  $15.2 \pm 0.2$  kpc,  $\alpha$ -element abundance  $[\alpha/Fe] \sim 0.25$  dex (the mean of  $[Mg/Fe]$ , and  $[Ca/Fe]$ ). Conclusions. BH176 is a member of old Galactic open clusters that presumably belong to the thick disk. It may have originated as a massive star cluster after the encounter of the forming thin disk with a high-velocity gas cloud or as a satellite dwarf galaxy.

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### Keywords

Galaxy: formation, Galaxy: structure, Globular clusters: general, Globular clusters: individual: BH176, Open clusters and associations: general