

Astronomers discover two new stars in a distant open cluster

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NGC 6830 is a fairly large and scattered cluster in Vulpecula that is almost lost amongst the numerous background stars of the Milky Way. Credit: Texas Tech University

(Phys.org)—An international team of astronomers has recently detected



two new so-called Be stars (non-supergiant stars with B spectral types and emission lines) residing in the open cluster NGC 6830, located some 5,300 light years away. The findings could shed new light on the presence of this type of star in old open clusters like NGC 6830. <u>A paper</u> <u>detailing the discovery</u> appeared online on Apr. 8 on the arXiv preprint server.

NGC 6830 is lying in the constellation Vulpecula and was discovered by William Herschel in 1784. The <u>cluster</u> is about 125 million years old and has a fairly loose structure. It was selected as the subject of the study because one of the known Be stars in the cluster is fairly bright. Thus NGC 6830 is suitable for observation with the Spectral Energy Distribution (SED) Machine, a spectrograph and imager for efficient and rapid classification, mounted on the Palomar 60 inch Telescope at the Palomar Observatory in California.

The team, led by Po-Chieh Yu of the National Central University in Taoyuan City, Taiwan, employed the SED Machine to obtain the optical spectra bright objects in the cluster. These observations were carried out on May 1, 2014. The researchers also conducted follow-up observations using the Hiyoyu spectrograph on the Lulin One-meter Telescope (LOT) at the Lulin Observatory in Xinyi, Taiwan and the Kast dual spectrograph on the 3m Shane <u>telescope</u> at the Lick Observatory, located in San Jose, California.

In addition to observing one previously known Be star in the cluster, designated NGC 6830-2 (also known as VES 72), the scientists spotted two new Be stars that were listed as NGC 6830-1 and NGC 6830-3.

"Three stars have been confirmed as Be stars with intermediate and late type spectra by using the SED-Machine on Palomar 1.5-m telescope, the Hiyoyu spectrograph on Lulin 1-m telescope, and the Kast dual spectrograph on Lick 3-m telescope," the researchers wrote in the paper.



Thus, the study suggests that there are three Be stars in the NGC 6830 cluster. According to the research, the spatial distribution of these stars might be caused by gravitational disruption over time. Complementary to previous papers, the new findings allowed the scientists to assume that old open clusters, like the one that was the subject of the new study, lack Be stars.

The researchers also noted that some Be stars show the variability with periods that might be due to pulsation or rotation. However, according to the team, the newly detected Be stars do not showcase any significant variability.

"This is consistent with the previous studies which showed that only 12 percent of B6-type Be stars have the variability with the amplitude of 0.12 to 0.3 mag," the paper reads.

The team concluded that in order to better understand the nature of Be stars, more comprehensive surveys should be performed in the future. The efforts should also include improving the quality of images acquired during observation campaigns. Therefore, it is important to eliminate the contamination of residual cosmic-ray hitting on the target region, which is not easily eliminated. According to the authors of the paper, procedures to remove cosmic ray contamination around science targets will be performed carefully in the future projects.

More information: Be Stars in the Open Cluster NGC 6830, arXiv:1604.02276 [astro-ph.SR] <u>arxiv.org/abs/1604.02276</u>

Abstract

We report the discovery of 2 new Be stars, and re-identify one known Be star in the open cluster NGC 6830. Eleven H-alpha emitters were discovered using the H-alpha imaging photometry of the Palomar Transient Factory Survey. Stellar membership of the candidates was



verified with photometric and kinematic information using 2MASS data and proper motions. The spectroscopic confirmation was carried out by using the Shane 3-m telescope at Lick observatory. Based on their spectral types, three H-alpha emitters were confirmed as Be stars with Halpha equivalent widths > -10 Angstrom. Two objects were also observed by the new spectrograph SED-Machine on the Palomar 60 inch Telescope. The SED-Machine results show strong H-alpha emission lines, which are consistent with the results of the Lick observations. The high efficiency of the SED-Machine can provide rapid observations for Be stars in a comprehensive survey in the future.

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