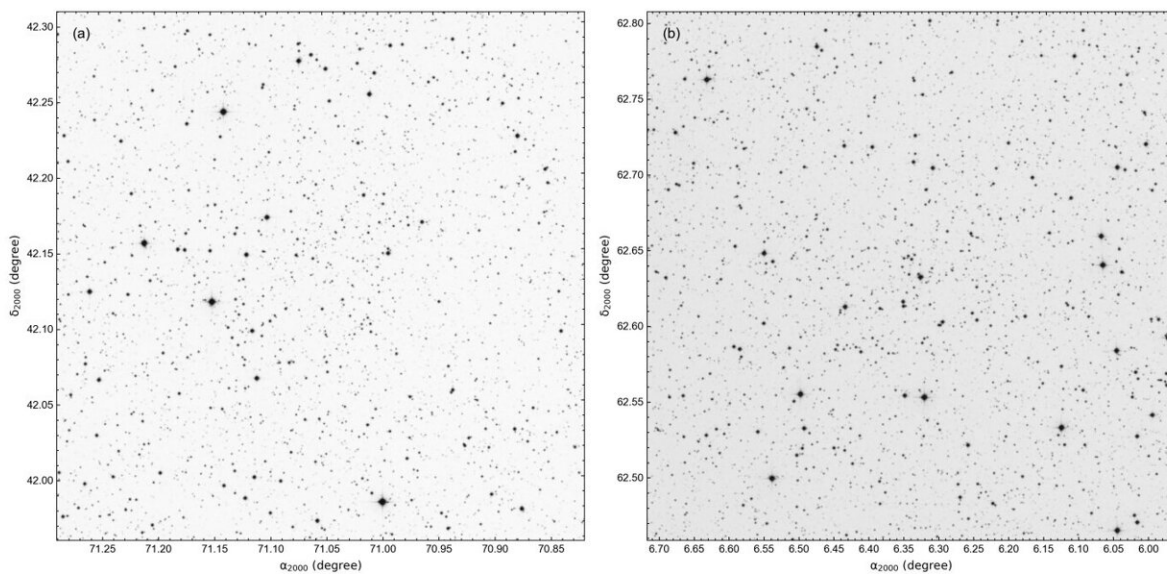


Astronomers inspect two galactic open clusters

November 28 2022, by Tomasz Nowakowski



Identification chart of stars located in regions of Berkeley 68 (a) and for Stock 20 (b). Credit: Yontan, *arXiv* (2022). DOI: 10.48550/arxiv.2211.09825

Using the Tubitak National Observatory (TUG) and ESA's Gaia satellite, Turkish astronomers have inspected Berkeley 68 and Stock 20—two galactic open clusters. Results of the study, presented November 17 on the arXiv pre-print server, deliver important insights into the nature and properties of these stellar groupings.

Open clusters (OCs), formed from the same giant molecular cloud, are groups of stars loosely gravitationally bound to each other. So far, more than 1,000 of them have been discovered in the Milky Way, and scientists are still looking for more, hoping to find a variety of these stellar groupings. Studying them in detail could be crucial for improving our understanding of the formation and evolution of our galaxy.

At a distance of some 11,000 [light years](#), Berkeley 68 is a Trumpler type IV2p OC in the second galactic quadrant with an estimated age of 2.1 billion years. It contains at least 1,200 stars and showcases a low central stellar concentration.

When it comes to Stock 20, it is a Trumpler type II2p OC with medium richness. The cluster is located about 8,500 light years away in the second galactic quadrant. Its age is estimated to be 19 million years.

A team of astronomers led by Talar Yontan of the Istanbul University, Turkey, is conducting a research project investigating previously poorly analyzed [open clusters](#) in the Milky Way galaxy. As part of this project, they investigated Berkeley 68 and Stock 20 by analyzing the data from TUG and Gaia.

"We performed detailed photometric and astrometric analyses of the open star clusters Berkeley 68 and Stock 20. This was based on ground based CCD UBV photometric data complemented by space-based Gaia Data Release 3 (DR3) photometry and astrometry," the researchers wrote in the paper.

First of all, the team determined the cluster limiting radii for the two OCs. They were calculated to be 22.8 and 20.7 light years for Berkeley 68 and Stock 20, respectively. Afterward, they identified 198 stars for Berkeley 68 and 51 stars for Stock 20 as probable members (only stars inside these limiting radii were considered to be potential members of

the clusters).

The study found that Berkeley 68 is older and located nearer than previously thought as its distance and age turned out to be approximately 9,800 light years and 2.4 billion years, respectively. The cluster has a metallicity at a level of -0.13 and reddening of 0.52 . Based on the orbital integration of Berkeley 68, the astronomers concluded that the cluster was born outside the solar circle at the birth radius of some 33,000 light years from the [galactic center](#) and therefore came from a comparatively metal-poor region of the Milky Way.

The results indicate that Stock 20 is located some 9,500 light years away and its age is 50 million years old. The cluster's reddening was estimated to be about 0.4 and its metallicity was found to be around -0.01 .

The study revealed that Berkeley 68 and Stock 20 are dynamically relaxed, given that their relaxation times were calculated to be 32.55 and 23.17 million years, respectively, and are therefore shorter than their ages.

More information: Talar Yontan, An investigation of open clusters Berkeley 68 and Stock 20 using CCD UBV and Gaia DR3 data, *arXiv* (2022). [DOI: 10.48550/arxiv.2211.09825](https://doi.org/10.48550/arxiv.2211.09825)

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