[박GC-05] Exploring the Formation of Galaxies through Metallicities of Globular Clusters

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Globular clusters (GCs) are among the oldest stellar objects in the universe and provide valuable constraints on many aspects of galaxy evolution. GC systems typically exhibit bimodal color distributions the phenomenon of which has been a major topic in the area of GC research. GC color bimodality established a paradigm where scenarios to explain its origin require two GC groups with different formation origins. The GC division, asserted mainly by photometric color bimodality so far, has been viewed as the presence of two distinct metallicity subgroups within individual galaxies. In this study, we make use of spectroscopy of GC systems associated with two giant galaxies, M31 (the Andromeda) and M87 (NGC 4486), to investigate the GC bimodality and the underlying metallicity distributions. Recent spectroscopy on the globular cluster (GC) system of M31 with unprecedented precision witnessed a clear bimodality in absorption-line index distributions of old GCs. Given that spectroscopy is a more detailed probe into stellar population than photometry; the discovery of index bimodality may point to the very existence of dual GC populations. However, here we show that the observed spectroscopic dichotomy of M31 GCs emerges due to the nonlinear nature of metallicity-to-index conversion and thus one does not necessarily have to invoke two separate GC subsystems. We present spectra of 130 old globular clusters (GCs) associated with the Virgo giant elliptical galaxy M87, obtained using the Multi-Object Spectrography (MOS) mode of Faint Object Camera and Spectrograph (FOCAS) on the Subaru telescope. M87 GCs with reliable metallicity measurements exhibit significant inflection along the color-metallicity relations, through which observed color bimodality is reproduced from a broad, unimodal metallicity distribution. Our findings lend further support to this new interpretation of the GC color bimodality, which could change much of the current thought on the formation of GC systems and their host galaxies.