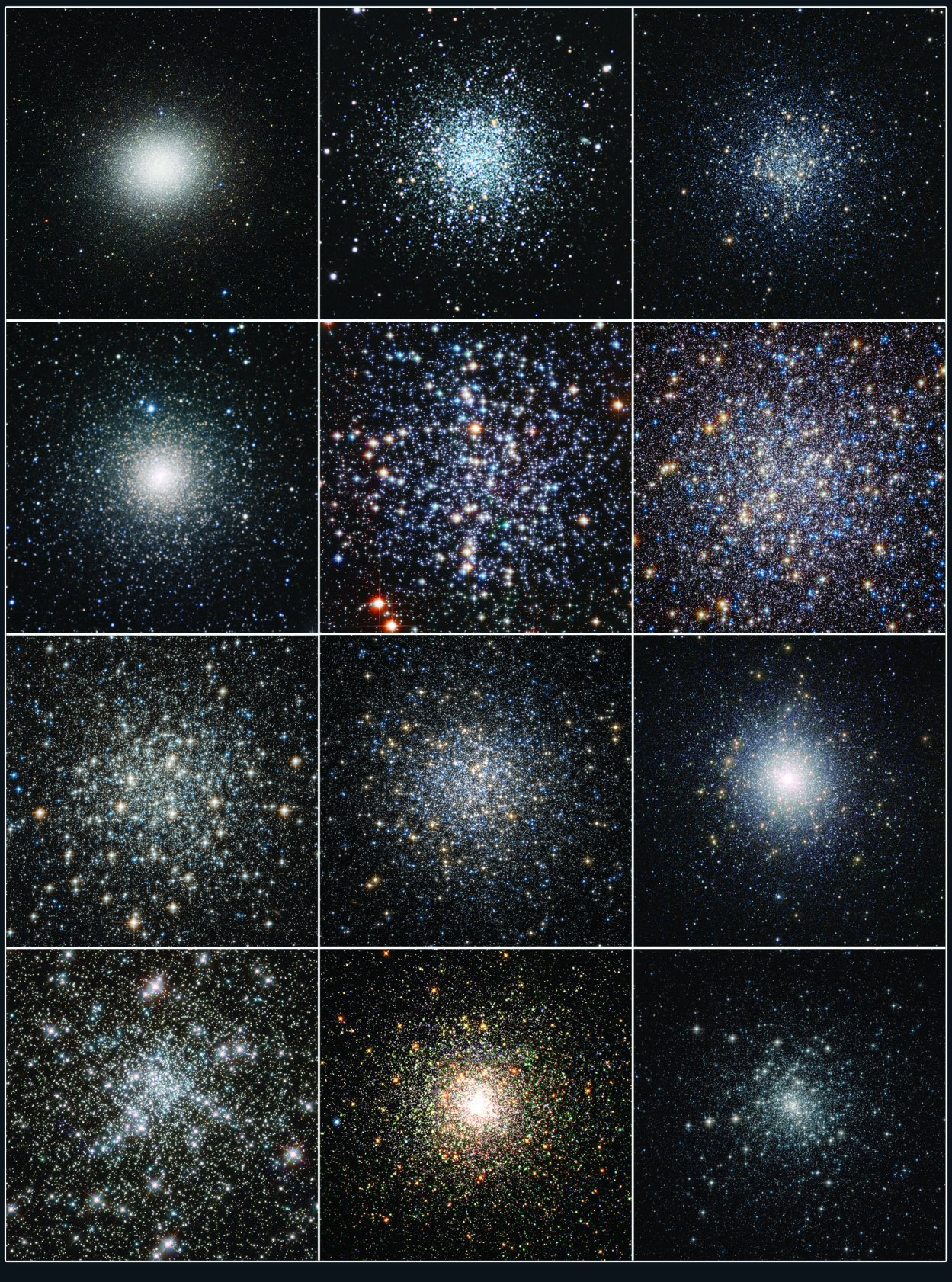
THE DYNAMICAL CLOCK



Mosaic of 12 images of Milky Way globular clusters ranked in order of increasing dynamical age, as measured by the "dynamical clock of stellar systems". From top-left, to bottom-right: omegaCentauri, NGC 288, M55, NGC 6388, M4, M13, M10, M5, 47 Tucanae, NGC 6752, M80, and M30.

Globular clusters are stellar aggregates counting up to a few million stars. Most of them formed at the same cosmic epoch (12-13 billion years ago, slightly after the Big Bang). Since then, however, they may have evolved rather differently from a dynamical point of view and clusters with the same chronological age may therefore have quite different "dynamical ages". The dynamical evolution is due to a variety of processes that, with efficiencies depending on the internal environment, tend to progressively segregate stars more massive than the average toward the cluster centre. Blue straggler stars are the result of either stellar collisions, or mass-transfer events in binary systems. Because they are among the most massive objects in old clusters, they can be used as gravitational test particles to probe dynamical evolution. By analyzing a sample of globular clusters in our own galaxy, an international team of astronomers has discovered that the observed radial distribution of blue straggler stars can be used as a cosmic clock to measure the dynamical age of stellar systems. The result was obtained within Cosmic-Lab, a five-year project funded by the European Research Council, aimed at probing the complex interplay between dynamics and stellar evolution. The research was led by Francesco Ferraro at the University of Bologna (Italy) and made in collaboration with the National Institute for Astrophysics (INAF), the European Southern Observatory (ESO) and a few institutes in US and Canada. It has been published in the December 20th, 2012 issue of the international science journal Nature (Ferraro et al. 2012, Nature, 492, 393-395).

Cosmic-Lab

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