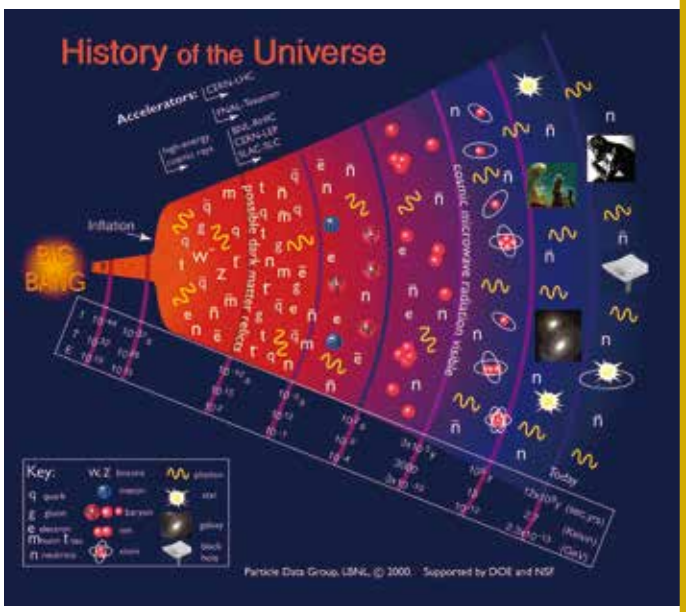
Chinese and Japanese Astronomers Discover the Most Lithium-rich Stars

Big Bang Nucleosynthesis (BBN) has produced three light elements: hydrogen, nitrogen and lithium. Measuring the abundances of these elements is the most reliable way to explore the physical condition in the first few seconds after the BBN. Recently, using LAMOST data and follow-up observations, the stellar abundance group at the National Astronomical Observatories of the Chinese Academy of Sciences (NAOC) and their Japanese coworkers discovered over ten super Lithium-rich metal-poor stars. Their discovery posed challenges to the standard evolution model for low-mass stars, and has been published by the *Astrophysical Journal Letters*.

The atmosphere of low-mass old stars preserves the primordial material produced by the BBN, and thus during their early stage (before the red giant), they tend to have a constant Li abundance. Along with their evolution, the dredge-up procedure will bring up the internal material and mix with the surface, which will significantly reduce the content of surface Li up to more than the order of one magnitude. Systematic observations of globular clusters have confirmed such evolution, and supported the success of stellar structure and evolution model. With decades of observations on stars, a dozen of Li-rich low-mass red giants were discovered, which could not be well explained by current modeling, while there is neither any systematic observation.

The NAOC team carried out the first systematic searching on Li-rich metal-poor stars with the Large Sky Area Multi-Object Fiber Spectroscopic Telescope (LAMOST) and follow-up observations with Subaru Telescope. They found 12 metal-poor stars which have



less than 1% solar metallicity but 10 times more Li than similar type of stars. These stars are with 0.8 solar mass or so, and much older than previously discovered Li-rich stars. More surprisingly, five of them are sub-giants, i.e., at the evolutionary stage before red giants.

It was the first discovery of such kind of stars in the Galactic field, and moreover, one of them contains more than 100 times of Li compared to similar stars, which becomes the new record of Li abundance in stars. Their research has provided crucial evidence to understanding the mechanism of Li enrichment in low-luminosity stars, as well as the classical stellar evolution model of low-mass stars.