

Stellar Archaeology as a Time Machine to the First Stars

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We have hosted an international conference “Stellar Archaeology as a Time Machine to the First Stars” for 5 days from December 3rd to December 7th. More than 90 researchers from 5 continents participated in the conference. The speakers were young scientists as well as well-respected professors, who presented their recent studies on Galactic archeology and the formation of first stars and galaxies. Nineteen posters were also displayed at the venue, where the participants discussed the results, exchanged ideas for further studies, and initiated collaboration.

The main science sessions focused on cutting-edge research topics such as the formation of the first stars, observation of metal-poor stars, and Galactic chemical evolution. Recent highlights from the GAIA mission and Subaru observations were introduced. We enjoyed exhaustive overviews on the recent progress in Galactic archeology and related fields. Updates on a variety of metal-poor stars discovered by large sky surveys allow to further test our theoretical models and to optimise upcoming observations.

The conference highlights include new calculations of the evolution of massive stars and the nucleosynthetic signatures, three-dimensional simulations of early chemical enrichment of the interstellar medium, and also results from spectroscopic determination of r-process element abundances in metal-poor stars. For the latter, the participants discussed the importance of binary neutron star mergers, of which the gravitational wave emission was recently detected. Moreover, new hints from theory and observation suggest that the direct descendants of the first stars are not necessarily extremely metal-poor, as previously claimed, but can also be found at moderate metallicities.

On the evening of the second day, we organised a public outreach event for high school students. (See also page 25.) We started with a scientific introduction by two IPMU scientists. Then, 13 scientists who came to Japan for the conference presented their research in short presentations. The audience, 40 high school students and further guests, had to find the one fake presentation amongst the 13 presentations and a majority

succeeded to identify it correctly. In a subsequent quiz, we tested the astronomy knowledge of the audience and awarded the winning team. Afterwards, the high school students seized the opportunity to chat with scientists and ask them all their questions about the Universe. Also, on the afternoon of the third day, the conference participants were able to experience Japanese culture by participating in laido, a Tea Ceremony, or Japanese Drums.

Galactic archeology is one of the major scientific goals of Subaru Telescope’s next-generation multi-object spectrograph, PFS. The systematic spectroscopic observation of metal-poor stars by PFS is expected to bring many breakthroughs for the galactic archeology community together with kinematic data of Galactic stars, supplementing the recent GAIA release. There are great expectations from the participants of this conference, and research on theoretical models and follow-up observations is proposed based on upcoming results from PFS.

