Research in Astron. Astrophys. **2012** Vol. **12** No. **7**, E1–E2
http://www.raa-journal.org *http://www.iop.org/journals/raa*

***R**esearch in*
***A**stronomy and*
***A**strophysics*

Editorial: The LAMOST survey at the Guo Shou Jing Telescope

Joss Bland-Hawthorn

Sydney Institute for Astronomy, University of Sydney, NSW 2006, Australia;
jbh@physics.usyd.edu.au

Abstract This special issue is devoted to the LAMOST star/galaxy survey now under way at the Guo Shou Jing Telescope in China. Here I review briefly the LAMOST survey in the context of recent, ongoing and future surveys on the international scene. The primary science goal is to obtain kinematics and abundance information for ten million stars over the Galaxy, far more than all other ground-based surveys combined. This rich trove will provide new insights and understanding about the workings of our Galaxy and its origins.

Key words: Editorial — telescope —- LAMOST

Over the past two decades, all-sky spectroscopic programs have been dominated by galaxy surveys, with more than a million galaxies now having accurately measured redshifts. During this time, stellar science was restricted to spectroscopic surveys amounting to roughly 20 000 stars in total. But a burgeoning literature on 'near-field cosmology' has highlighted the importance of understanding the origin and evolution of Local Group galaxies, in particular, our own Milky Way. The stellar record is a vast repository of information that we have barely begun to explore. We now speak of Galactic archaeology in our search for ancient systems that tell us of times past.

If recent times have been dominated by galaxy redshift surveys (far-field cosmology), the present decade is surely the era of huge stellar surveys. For many years, we have cataloged the brightness and colors of stars over the sky. These surveys tell us of an ancient halo and thick disk encompassing an old stellar bulge and evolving thin disk. More than half of all stars that make up these components were formed before a redshift of unity when the Universe was half its present age. And now we seek to know more. What are the details of the kinematics and chemistry of each component? Are they really smooth, simple systems or do they carry important details about their formation?

Large spectroscopic surveys are already under way. These include the SEGUE and APOGEE surveys based at Apache Point Observatory, and the RAVE and HERMES (soon to start) surveys at Siding Spring Observatory, with more in the pipeline. But by far the most extensive of these is the LAMOST Experiment for Galactic Understanding and Exploration (LEGUE) survey at the Guo Shou Jing Telescope (GSJT) with its stated goal of obtaining spectroscopy for ten million stars. This is an order of magnitude larger in scope than any other ongoing or envisaged ground-based survey.

This special issue is devoted to the science goals of the LEGUE project. Over a hundred papers have already appeared describing the GSJT and its instrumentation. In this issue, four of the papers describe the LEGUE pilot survey and the survey in its entirety; two papers describe the LEGUE stellar survey and its target selection, and one paper describes the site conditions at the GSJT. These papers are:

(1) The LAMOST spectral survey (Zhao et al. 2012)
(2) The LEGUE science plan (Deng et al. 2012)
(3) The LEGUE survey target selection (Carlin et al. 2012)
(4) The site conditions for the LAMOST spectral survey (Yao et al. 2012)
(5) The design of the LAMOST pilot survey in dark nights (Yang et al. 2012)
(6) The design of the LAMOST pilot survey in bright nights (Zhang et al. 2012)
(7) The design of the LAMOST pilot survey for the disk of the Galaxy (Chen et al. 2012)

From the early results of the pilot survey, it is clear that the Guo Shou Jing Telescope is ideally suited to huge stellar surveys with its innovative 4000 fiber robotic positioner and 5° field of view. But not to be outdone, the extragalactic community has put together the LEGAS survey to obtain spectra of more than a million galaxies (Zhao et al. 2012). It is plausible that there is a role for the LAMOST collaboration to include large numbers of active galaxies, particularly QSOs.

These are exciting times for stellar science and Galactic archaeology. In just a few years, we can look forward to a brilliant synergy between the LEGUE survey and the ESA *Gaia* astrometric mission. This 5-year space experiment commencing in 2013 will obtain accurate space motions of millions, even billions, of stars. The LEGUE "bright survey" stars all fall within range ($r < 18$); this is where *Gaia* performs best in terms of accurate distances and 3D space motions. The combination of stellar kinematics and chemistry, which started with Nancy Roman's pioneering observations in the 1950s, will reach new levels of sophistication, providing deep insights into the workings of our Galaxy and its origins.

References

Carlin, J. L., Lépine, S., Newberg, H. J., et al. 2012, RAA (Research in Astronomy and Astrophysics), 12, 755
Chen, L., Hou, J., Yu, J., et al. 2012, RAA (Research in Astronomy and Astrophysics), 12, 805
Deng, L., Newberg, H. J., Liu, C., et al. 2012, RAA (Research in Astronomy and Astrophysics), 12, 735
Yang, F., Carlin, J. L., Newberg, H. J., et al. 2012, RAA (Research in Astronomy and Astrophysics), 12, 781
Yao, S., Liu, C., Zhang, H., et al. 2012, RAA (Research in Astronomy and Astrophysics), 12, 772
Zhang, Y., Carlin, J., Liu, C., et al. 2012, RAA (Research in Astronomy and Astrophysics), 12, 792
Zhao, G., Zhao, Y. H., Chu, Y. Q., Jing, Y. P. & Deng, L. 2012, RAA (Research in Astronomy and Astrophysics), 12, 723