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Setting the Scene for Gaia and LAMOST

Edited by

Sofia Feltzing

Gang Zhao

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SETTING THE SCENE FOR GAIA AND LAMOST - THE CURRENT AND
NEXT GENERATIONS OF SURVEYS AND MODELS

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COVER ILLUSTRATION:

The picture on the front is a montage showing the Gaia satellite and the LAMOST telescope in front of the Jade Dragon Snow Mountain in Lijiang.

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**SETTING THE SCENE FOR GAIA
AND LAMOST - THE CURRENT
AND NEXT GENERATIONS OF
SURVEYS AND MODELS**

**PROCEEDINGS OF THE 298th SYMPOSIUM OF
THE INTERNATIONAL ASTRONOMICAL UNION
HELD IN LIJIANG, CHINA
MAY 20–24, 2013**

Edited by

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Table of Contents

Preface	xiii
Organizing committee	xiv
Conference photograph	xvi
Conference participants	xx
Dedication.....	xxii
Address by the Local Organizing Committee	xxiv
<i>Z. Han, H. Li, & Y. Liu</i>	
Address by the Scientific Organizing Committee	xxv
<i>G. Zhao</i>	
Galactic Astronomy: Past, present & future; A personal view.....	1
<i>J. Andersen</i>	
Observing the Milky Way	
The Milky Way thin disk structure as revealed by stars and young open clusters	7
<i>G. Carraro</i>	
Characterisation of the Galactic thick disk	17
<i>T. Bensby</i>	
A review of the elemental abundances and kinematics of the Galactic bulge....	28
<i>L. Origlia</i>	
Variable Stars and Galactic Structure	40
<i>M. Feast & P. Whitelock</i>	
Detailed studies of classical dwarf spheroidal galaxies in the Milky Way halo ...	53
<i>E. Tolstoy</i>	
Peculiar stars as guides to key processes in the early halo.....	59
<i>J. Andersen & B. Nordström</i>	
The evolution of C and O abundances in stellar populations.....	65
<i>P. E. Nissen & W. J. Schuster</i>	
Chemical differences and similarities among the kinematically selected thick disk, inner halo and outer halo stars	71
<i>M. Ishigaki, W. Aoki & M. Chiba</i>	
Moving groups in the Galactic disc	77
<i>P. Ramya & B. E. Reddy</i>	

Two distinct halo populations in the solar neighborhood: evidence from stellar abundance of beryllium	83
<i>K. Tan & G. Zhao</i>	
Bimodal chemical evolution of the Galactic disk and the barium abundance of Cepheids	86
<i>J. R. D. Lépine, S. Andrievky, D. A. Barros, T. C. Junqueira & S. Scarano Jr.</i>	
A comprehensive tool for the statistical comparison of large surveys to models of the Galaxy	92
<i>A. Ritter</i>	
MilkyWay@home: harnessing volunteer computers to constrain dark matter in the Milky Way	98
<i>H. J. Newberg, M. Newby, T. Desell, M. Magdon-Ismail, B. Szymanski & C. Varela</i>	
Modelling the Milky Way	
Dynamical structures in the Galactic disk	105
<i>A. Quillen</i>	
Dynamical models and Galaxy surveys	117
<i>J. Binney & J. L. Sanders</i>	
The chemo-dynamical evolution of the Milky Way disc – A new modeling approach	130
<i>I. Minchev, C. Chiappini & M. Martig</i>	
Stellar yields for chemical evolution modeling	142
<i>A. Karakas</i>	
Supernovae yields for chemical evolution modelling	154
<i>K. Nomoto & T. Suzuki</i>	
Chemodynamical simulations of the Milky Way galaxy - inhomogeneous chemical enrichment	167
<i>C. Kobayashi</i>	
The Milky Way and the current status of galaxy formation models	179
<i>P. Tissera</i>	
Constraining dynamical models with observational data	185
<i>J. Bovy</i>	
Stream-orbit misalignment and a new algorithm for constraining the Galactic potential with streams	195
<i>J. Sanders & J. Binney</i>	
Dynamical modeling of the Milky Way bulge	201
<i>J. Shen</i>	
Action-space clustering of tidal streams to map the Galactic potential	207
<i>R. E. Sanderson, A. Helmi & D. W. Hogg</i>	

Interstellar medium and dust

The 3-Dimensional distribution of interstellar dust.	213
<i>J. Murthy</i>	
Star formation in galaxies: the roles of spiral arms.	221
<i>C. Dobbs</i>	
How can star formation be sustained?	228
<i>F. Fraternali</i>	
Mapping the three-dimensional multi-band extinction and diffuse interstellar bands in the Milky Way with LAMOST.	240
<i>H.-B. Yuan, X.-W. Liu, M.-S. Xiang, Z.-Y. Huo, H.-H. Zhang, Y. Huang & H.-W. Zhang</i>	
Using synthetic emission maps to constrain the structure of the Milky Way	246
<i>A. R. Pettitt, C. L. Dobbs, D. M. Acreman & D. J. Price</i>	

Gaia, LAMOST and the large surveys

Unveiling the Galaxy with Gaia	253
<i>A. Vallenari</i>	
Gaia and the variable stars	265
<i>L. Eyser, B. Holl & N. Mowlavi</i>	
LAMOST experiment on Galactic understanding and exploration: An overview	269
<i>L. Deng</i>	
What did we learn about the Milky Way during the last decade, and what shall we learn using Gaia and LSST?	281
<i>Ž. Ivezić, T. C. Beers, M. Jurić, S. R. Loebman, & M. Berry</i>	
The RAVE harvest: from the relation between abundances and kinematic of the Milky Way stars to tools for the abundance analysis of the spectra	292
<i>C. Boeche & the RAVE collaboration</i>	
Chromospherically active stars in the RAVE Survey	298
<i>M. Žerjal, T. Zwitter, G. Matijević, K. G. Strassmeier & RAVE Collaboration</i>	
Properties of abundance gradient along the Galactic disk and the role of LAMOST	304
<i>J. L. Hou, L. Chen, J. C. Yu, J. Sellwood & C. Pryor</i>	
LSS-GAC – A LAMOST spectroscopic survey of the galactic anti-center	310
<i>X. Liu, H.-B. Yuan, Z.-Y. Huo, L.-C. Deng, J.-L. Hou, Y.-H. Zhao, G. Zhao, J.-R. Shi, A.-L. Luo, M.-S. Xiang, H.-H. Zhang, Y. Huang & H.-W. Zhang</i>	
The GALAH survey.	322
<i>B. Anguiano, K. Freeman, J. Bland-Hawthorn, G. De Silva, M. Asplund, D. Carollo, V. D’Orazi, S. Keller, S. Martell, S. Sharma, C. Sneden, L. Wylie de Boer, D. Zucker, T. Zwitter & the GALAH survey team</i>	

Strömgren-Crawford $uvby\beta$ all sky survey - towards understanding of the Galaxy <i>W. Wang, G. Zhao, Y. Chen & Y. Liu</i>	326
 Elemental abundances in stars - pitfalls for interpreters	
The sun. A typical star in the solar neighbourhood? <i>J. Meléndez</i>	331
3D modeling of stellar atmospheres and the impact on the understanding of the reliability of elemental abundances in stars as tracers of galactic chemical evolution <i>H.-G. Ludwig, M. Steffen, P. Bonifacio, E. Caffau, A. Kučinskas & B. Freytag</i>	343
Review: progress in NLTE calculations and their application to large data-set . . <i>L. Mashonkina</i>	355
Automated stellar abundance analysis <i>A. Recio-Blanco</i>	366
Fundamental stellar properties from asteroseismology <i>V. Silva Aguirre, L. Casagrande & A. Miglio</i>	375
Abundance analysis of three metal poor stars: CS22166-0030, CS22186-0005, and CS30344-0033 <i>Ş. Çalışkan, E. Caffau, P. Bonifacio, L. Sbordone & B. Albayrak</i>	381
Influence of departures from LTE on oxygen abundance determination in the at- mospheres of A - K stars <i>T. Sitnova, L. Mashonkina, G. Zhao, T. Ryabchikova & Y. Pakhomov</i>	387
 Posters (alphabetical after first author)	
Non-LTE abundances of sodium in the atmospheres of red giants of the thick and thin Galactic disks <i>S. Alexeeva, Y. Pakhomov & L. Mashonkina</i>	394
Constraints on the Galactic bar with RAVE <i>T. Antoja, A. Helmi & the RAVE collaboration</i>	395
Testing the chemical tagging with old OC <i>S. Blanco-Cuaresma, C. Soubiran, P. Jofré & U. Heiter</i>	396
Nearby kinematic wiggles from LEGUE <i>J. L. Carlin, H. J. Newberg, L. Deng, J. Delaunay, D. Gole, K. Grabowski, C. Liu, Y. Xu, F. Yang & H. Zhang</i>	397
The correction of fiber throughput variation due to focal ratio degradation. . . . <i>J. Chen, Z. Bai & G. Li</i>	398
Stellar population analysis of galaxies in SDSS and LAMOST Pilot Survey <i>X. Chen, A. Luo & H. Yang</i>	399

A systematic study of NLTE abundances of nearby stars	400
<i>Y. Q. Chen, G. Zhao, L. Mashonkina, J. R. Shi, H. W. Zhang & K. F. Tan</i>	
Data resources and services at CAsDC	401
<i>C. Cui, B. He, J. Xiao, C. Yu, J. Li, Z. Cao, L. Su, D. Fan, C. Qiao, C. Li, Y. Chen, R. Wang & Y. Zhao</i>	
The mixed origin of the Galactic thick disk.	402
<i>W. Y. Cui, C. Liu, P. de Laverny, A. Recio-Blanco & G. Van de Ven</i>	
Fiber positioning test.	403
<i>Y. Dong, H. Zhang, Z. Bai, H. Yuan & Y. Lei</i>	
Estimation of Galactic model parameters in high latitudes with the SDSS and SCUSS	404
<i>C. Du, Y. Jia & X. Peng</i>	
A matched-filter map of the 300 km/s stream.	405
<i>C. J. Grillmair</i>	
Weak atomic diffusion trends in NGC 6752	406
<i>P. Gruyters, A. J. Korn & P. S. Barklem</i>	
On atomic diffusion and the cosmological lithium abundance	407
<i>P. Gruyters, A. J. Korn & P. S. Barklem</i>	
Chemical tagging with Gaia-ESO Survey and Gaia-RVS data.	408
<i>G. Guiglion, A. Recio-Blanco & P. de Laverny</i>	
Strontium in the era of Gaia and LAMOST	409
<i>C. J. Hansen, E. Caffau & M. Bergemann</i>	
3D Galactic extinction modelling	410
<i>R. J. Hanson & C. A. L. Bailer-Jones</i>	
Probing non-spherical dark halos in the Galactic dwarf satellites	411
<i>K. Hayashi & M. Chiba</i>	
The global dark halo structure of the Andromeda galaxy	412
<i>K. Hayashi & M. Chiba</i>	
Velocity distributions of surviving companion stars of type Ia supernovae in the Milky Way.	413
<i>S. Jia, B. Wang & Z. Han</i>	
Estimation of Galactic model parameters in high latitude with SDSS and SCUSS	414
<i>Y. Jia & C. Du</i>	
An OGLE view of the bulge and Sagittarius.	415
<i>S. Jin, E. K. Grebel & R. Haschke</i>	
The light side and the dark side of the Milky Way halo.	416
<i>P. R. Kafle, S. Sharma, G. F. Lewis & J. Bland-Hawthorn</i>	

Symbiotic stars as tracers of Galactic structures	417
<i>L. Leedjävrv</i>	
Offsetting the bright sources for LAMOST	418
<i>Y. J. Lei, H. T. Zhang, Y. Q. Dong & H. L. Yuan</i>	
The abundance distribution of $[\alpha/\text{Fe}]$ in the Galactic disk stars	419
<i>J. Li & R. Fu</i>	
The methods for searching hypervelocity star candidates from the SDSS	421
<i>Y. Li, A. Luo, G. Zhao & Y. Lu</i>	
Binary star stellar population synthesis model for astrophysical studies	422
<i>Z. M. Li, C. Y. Mao, L. Chen & Q. Zhang</i>	
The 3-D extinction law in the 2nd quadrant of the Galactic disk	423
<i>C. Liu, M. Fang, Y. Wu, K. Carrell, X. Xue & G. van de Ven</i>	
The Galactic rotation curve from red clump stars	424
<i>C. Liu, G. van de Ven, M. Fang, Y. Wu, K. Carrell & X. Xue</i>	
The identification of K giant stars in LAMOST pilot survey	425
<i>C. Liu, F. Yang, L. Deng, Y. Xu, W. Cui, X. Xue, S. Gao, Y. Zhang & Y. Xin</i>	
Finding the lost siblings of the Sun	426
<i>C. Liu, S. Feltzing & G. Ruchti</i>	
The photometric system of the Nanshan One-meter Wide Field Telescope	427
<i>J. Liu, Y. Zhang, G. Feng & C. Bai</i>	
Data reduction and calibration for LAMOST survey	428
<i>A. Luo, J. Zhang, J. Chen, Y. Song, Y. Wu, Z. Bai, F. Wang, B. Du & H. Zhang</i>	
Near-infrared spectroscopy of Cepheids in the Galactic nuclear disk	429
<i>N. Matsunaga, K. Fukue, N. Kobayashi, Y. Ikeda, R. Yamamoto, S. Kyu, S. Hamano, C. Yasui, T. Tsujimoto, W. Aoki, S. Nishiyama, T. Nagata, K. Genovali, L. Inno & G. Bono</i>	
Traces of the formation history of the Milky Way	430
<i>B. Nordström, E. Stonkutė, R. Ženovienė & G. Tautvaišienė</i>	
Binary white dwarfs in the galactic halo	431
<i>P. van Oirschot, G. Nelemans, A. Helmi, E. Starkenburg, O. Pols & A. G. A. Brown</i>	
The stellar metallicity distribution of the Galaxy from the BATC survey	432
<i>X. Peng, C. Du, Z. Wu, J. Ma & X. Zhou</i>	
Chromospheric variabilities of M active stars based on Guoshoujing Telescope	433
<i>Q. F. Pi, L. Y. Zhang, J. R. Shi, H. Wu, Y. H. Zhao, A. L. Luo, J. K. Zhao, A. Y. Zhou, X. S. Fang & LAMOST Collaboration</i>	
Halo kinematic streams in the era of gaia	434
<i>P. Re Fiorentin, A. Curir, M. G. Lattanzi & A. Spagna</i>	

The SED Machine - Fast classification of transient objects	435
<i>Andreas Ritter, N. Konidaris, C. C. Ngeow, R. Quimby & S. Ben-Ami</i>	
Testing SME determination of stellar parameters	436
<i>T. A. Ryabchikova, L. I. Mashonkina, A. R. Titarenko, S. A. Alexeeva, Yu. V. Pakhomov, N. E. Piskunov, T. M. Sitnova & B. A. Nizamov</i>	
Statistical equilibrium of silicon in the atmospheres of cool stars	437
<i>J. R. Shi, T. Gehren, L. Mashonkina & G. Zhao</i>	
Relations of stellar mass and electron temperature-based metallicity of star-forming galaxies in wide mass range	438
<i>W. Shi, Y. Liang & F. Hammer</i>	
The chemical evolution of heavy elements in globular clusters.	439
<i>L. J. Shingles, A. I. Karakas & R. Hirschi</i>	
Measuring stellar radial velocity using Markov Chain Monte Carlo(MCMC) Method	441
<i>Y. Song, A. Luo & Y. Zhao</i>	
Helium double-detonation explosions for the progenitors of type Ia supernovae .	442
<i>B. Wang, D. Liu, S. Jia & Z. Han</i>	
High velocity and hypervelocity stars from the companions of type Ia supernovae	443
<i>B. Wang, D. Liu, S. Jia & Z. Han</i>	
Error analysis of SDSS/LAMOST stellar radial velocity measurement	444
<i>F. Wang, A. Luo & H. Zhang</i>	
Comparison of determined stellar parameters between LAMOST and SEGUE spectra.	445
<i>Y. Wu, A. Luo, B. Du & Y. Guo</i>	
The explosive universe with Gaia	446
<i>L. Wyrzykowski, S. T. Hodgkin, N. Blagorodnova & V. Belokurov</i>	
The velocity distribution in the solar neighborhood from LAMOST pilot survey	447
<i>Q. Xia, C. Liu, Y. Xu, S. Mao & S. Gao</i>	
Flux calibration for LAMOST spectroscopic survey of the Galactic anti-center. .	448
<i>M.-S. Xiang, X.-W. Liu, H.-B. Yuan, Y. Zheng, Z.-Y. Huo, Y. Huang & LAMOST Collaboration</i>	
Searching for extremely alpha-poor stars in the Galactic halo.	449
<i>Q. Xing & G. Zhao</i>	
Exploration of Galactic structures beyond the Sun toward the anti-center of the Milky Way.	450
<i>Y. Xu & H. Newberg et al.</i>	
Abundance analysis of barium stars	451
<i>G. Yang, Y. Liang, W. Cui & B. Zhang</i>	
Development of target allocation methods for LAMOST focal plate.	452
<i>H. Yuan, H. Zhang, Y. Zhang, Y. Lei & Y. Dong</i>	

Scandium abundance in metal-poor stars	453
<i>H. W. Zhang, T. Gehren & G. Zhao</i>	
Chromospheric activities of late-type stars based on Guoshoujing Telescope	454
<i>L. Y. Zhang, G. Y. Zhang, J. R. Shi, A. L. Luo, J. K. Zhao, Y. H. Zhao, H. Wu, A. Y. Zhou, Q. F. Pi & LAMOST Collaboration</i>	
Plasma diagnostics of emission-line galaxies in SDSS	455
<i>Z. Zhang, Y. Liang & F. Hammer</i>	
Three wide binaries in LAMOST pilot survey	456
<i>J. K. Zhao, G. Zhao & T. D. Oswalt</i>	
Origin and evolution of the Moon.	457
<i>C. Zhong</i>	
Author index	458

Preface

The formation and evolution of galaxies is a key topic in contemporary astrophysics, which can be studied in essentially two ways: through the study of large numbers of galaxies at different times of the evolution of the universe, or through the detailed study of the Milky Way and its close neighbors. The latter is often referred to as near-field cosmology or galactic astronomy, and can provide surprisingly strong constraints on models of galaxy formation and evolution. However, the study of the Milky Way as a galaxy is not an easy task.

In 1944 Walter Baade introduced the concept of stellar populations. The concept has remained a highly useful tool to quickly identify and classify different generations of stars in galaxies. The last decades have seen a move away from this fairly static, even if complex, concept to a more dynamic and flexible way of characterizing the stellar components in the Milky Way by means of the individual star's age, metallicity, elemental abundances and orbit. This shift has benefited from advances both in theory and in observations. In particular the advent of wide field CCDs and dedicated survey telescopes as well as advances in computer technology that now allows for truly detailed models of various aspects of the evolution of the Milky Way has moved the study of our Galaxy into the first part of a new era. The advent of Gaia will take us truly into the era of precision studies of the Milky Way as a galaxy.

Several very large surveys have contributed and will continue to contribute to our deepening understanding of the Milky Way. Gaia is scheduled to launch in 2013 and will provide parallaxes and proper motions for a billion objects and radial velocities for 150 million stars, enabling the exploration of the Milky Way to take an unprecedented leap forward. These changes put stringent new demands on our analysis of the data and modeling of the Galaxy.

With the transformational opportunities offered by on-going and next generation surveys, we proposed an IAU symposium with focus on the interplay between surveys, observing techniques, advances in abundance analysis, and our theoretical understanding of galaxy formation. These proceedings are the concluding part of this symposium.

The symposium took place in Lijiang, China during May 20-24, 2013. During the conference a number of highly interesting reviews were presented as well as contributed talks and almost one hundred posters.

However well a SOC arranges the programme, the ultimate success of a meeting at this level depends so much on the local arrangements. We want to give our special thanks to the LOC who worked tirelessly before and during the symposium to create the best opportunities for a fruitful meeting. Many participants have later expressed to us how well the local organization worked and what a good time they had visiting Lijiang. The SOC would like to thank the LOC for all their hard work and for making the symposium a success.

Finally, we hope that you will enjoy reading the articles in this volume as much as we have done.

*Sofia Feltzing and Gang Zhao, co-chairs SOC,
Lund and Beijing, August 23, 2013*

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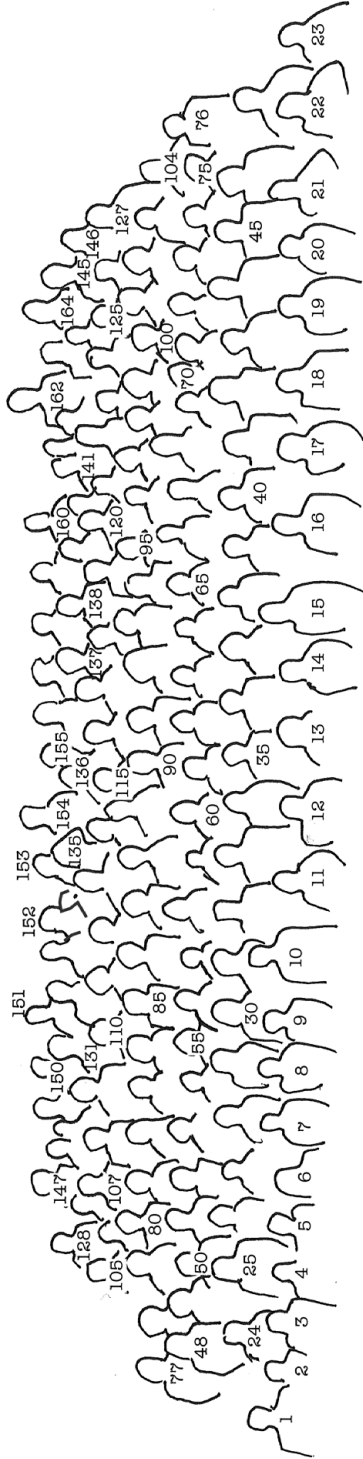
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CONFERENCE PHOTOGRAPH





1.	Chuanjun Wang	42.	Bacham Reddy	83.	Livia Origlia	124.	Jinliang Hou
2.	Jianguo Wang	43.	Kenichi Nomoto	84.	Qingfeng Pi	125.	Luca Casagrande
3.	Yujuan Liu	44.	Thomas Bensby	85.	Ji Li	126.	Haotong Zhang
4.	Dan Wang	45.	John Menzies	86.	Huawei Zhang	127.	Vasily Belokurov
5.	Yuqin Chen	46.	Jayant Murthy	87.	Shaoming Hu	128.	Pim van Oirschot
6.	Jiannan Zhang	47.	Nicolas Martin	88.	Jingkun Zhao	129.	Qirong Zhu
7.	Shilin Zhang	48.	Teresa Antoja	89.	Liyun Zhang	130.	Tatyana Sitnova
8.	Meng Zhai	49.	Yan Xu	90.	Jianrong Shi	131.	Chengdong Li
9.	Xiang Li	50.	Yanxin Guo	91.	Guangwei Li	132.	Yunpeng Jia
10.	Sergi Blanco-Cuaresma	51.	Ramya Pozhath	92.	Michelle Collins	133.	Corrado Boeche
11.	André Martins	52.	Şeyma Caliskan	93.	Fengfei Wang	134.	Patrick de Laverny
12.	Jie Zheng	53.	Yinbi Li	94.	Wei Zhang	135.	Clare Dobbs
13.	Emma Small	54.	Xiyan Peng	95.	Huoming Shi	136.	Remo Collet
14.	Miho Ishigaki N.	55.	Xiaoling Yang	96.	Bo Wang	137.	Mark Wilkinson
15.	Amanda Karakas	56.	Xiaoyan Chen	97.	Shi Jia	138.	Tristan Cantat
16.	Noriyuki Matsunaga	57.	Yue Wu	98.	Wei Wang	139.	Jianjun Chen
17.	Alberto Rebassa-Mansergas	58.	Camilla Juul Hansen	99.	Alex Pettitt	140.	Li Chen
18.	Laurits Leedjäv	59.	Chiaki Kobayashi	100.	Jing Li	141.	Chao Liu
19.	Yuxin Xin	60.	Xiaoting Fu	101.	Guillaume Guiglion	142.	Qiran Xia
20.	Yufeng Fan	61.	Patricia B. Tissera	102.	Matthew Molloy	143.	Paola Re Fiorentin
21.	Edward Ford Schlafly	62.	Haibo Yuan	103.	Maosheng Xiang	144.	Heidi Newberg
22.	Filippo Fraternali	63.	Yunfeng Chen	104.	Ivan Minchev	145.	John Vickers
23.	Giacomo Monari	64.	Parjwal Kafle	105.	Robyn Sanderson	146.	Iulia Simion
24.	Giovanni Carraro	65.	Sanjib Sharma	106.	Jing Ren	147.	Weimin Yi
25.	Marcel Zemp	66.	Andreas Ritter	107.	Lovro Palaversa	148.	Lan Zhang
26.	Martin Smith	67.	Jorge Meléndez	108.	Yihan Song	149.	Weibin Shi
27.	Jinming Bai	68.	Thomas Nordlander	109.	Hans-Günther Ludwig	150.	Kenneth Carrell
28.	Eline Tolstoy	69.	Paulina Assman	110.	Victor Silva Aguirre	151.	Ningchen Sun
29.	Yaoquan Chu	70.	Vivien Reuter	111.	Hailong Yuan	152.	Kohei Hayashi
30.	Poul Erik Nissen	71.	Zhixia Shen	112.	Jeffrey Carlin	153.	Alejandra Reccio-Blanco
31.	James Binney	72.	Marusa Zerjal	113.	Carl Grillmar	154.	Mattias Schultheis
32.	Hans-Walter Rix	73.	Zhitai Zhang	114.	Sergey Guziy	155.	Cheng Liu
33.	Jacques Lépine	74.	Sofya Alexeeva	115.	Gang Wang	156.	Qianfan Xing
34.	Alice Quillen	75.	Cuihua Du	116.	Luke Shingles	157.	Yujing Qin
35.	Xiaowei Liu	76.	Mark Gieles	117.	Laurent Eyer	158.	Kefeng Tan
36.	Gang Zhao	77.	Juntao Shen	118.	Željko Ivezić	159.	Shanwei Hong
37.	Birgitta Nordström	78.	Piercarlo Bonifacio	119.	Leopoldo Infante Lira	160.	Awat Rahimi
38.	Johannes Andersen	79.	Shoko Jin	120.	Pieter Gruyters	161.	Licai Deng
39.	Patricia Whitelock	80.	Jinzhong Liu	121.	Yiqiao Dong	162.	Richard Hanson
40.	Michael Feast	81.	Naomi McClure-Griffiths	122.	Jason Sanders	163.	Ali Luo
41.	Lyudmila Mashonkina	82.	Antonella Vallenari	123.	Wenyuan Cui	164.	Yang Huang

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Dedication of the Symposium



Johannes Andersen and Birgitta Nordström attending a session at the IAU Symposium 298.

The SOC wishes to dedicate IAU Symposium 298 to Johannes Andersen and Birgitta Nordström for their numerous contributions to Galactic astronomy.

As 2013 sees Johannes' 70th birthday, we wished to celebrate his and Birgitta's achievements during IAU Symposium 298.

Galactic astronomy is, as witnessed by the programme of this symposium, a huge subject, encompassing everything from detailed stellar parameters, through stellar positions to large-scale surveys of stars and gas. Johannes and Birgitta excel in so many of these fields and have contributed greatly to furthering our understanding of the stellar constituents of the Milky Way. The hallmark of all their work is a great attention to detail, which results in really high quality data. To us, and younger generations of astronomers, this is an inspiration and a guiding light, showing us that it is not only desirable but also feasible to insist on the best data possible, a process that is not always fast, but always rewarding.

In particular, Birgitta and Johannes played a vital role in the Geneva-Copenhagen Survey and they guided it to its conclusion with joint efforts. The survey is one of the first really large-scale, highly detailed stellar surveys of the solar neighbourhood. It provides a vital test-bed for near-field cosmology and has served as a source for numerous studies.

Together with Hipparcos parallaxes, this pioneering project provided metallicities, ages and orbits of nearby stars, revolutionizing our understanding of the Galactic disc. It gives the most detailed picture that we have of the solar neighbourhood as traced by long-lived stars. Eventually, this detail-rich study will be connected to the larger solar environs and joined up with surveys at larger distances, such as SDSS and RAVE. The Geneva-Copenhagen Survey will remain a fundamental stepping-stone for now on-going deeper surveys and blaze a trail for the forthcoming Gaia mission and other future stellar population studies.

We would also like to recognize Johannes and Birgitta's substantial service and leadership in the strategic development of international astronomy, commending their never-tiring work to enable astronomical research. Both have served on numerous committees nationally and internationally, paving the way for the rest of us who are too busy doing science to actually also promote it within the administrative structures. Johannes served as the general secretary for the IAU 1997 – 2000 and assistant general secretary 1994 – 1997. As the chair of the ASTRONET board he worked extensively to promote the roadmaps for European astronomy and astronomical infrastructure. Having been the director of the Ground Based Astronomical Instrument Centre (IJAF) at Copenhagen University, he became the director of the Nordic Optical Telescope (NOT), on La Palma, in 2002. Birgitta has served on many committees within ESO as well as the IAU. She was the chair of ESO's committee for the Future of La Silla in the VLT Era, and since 1995 has served as the Treasurer and Member of Council of the European Astronomical Society (EAS). In 2011 she became a member of the Board of Directors of the *Astronomy & Astrophysics* journal.

Many of us have been recipients of Birgitta and Johannes' hospitality, including the reception concluding this symposium. As a young postdoctoral fellow it was particularly inspiring for one of us (SF) to be invited to Johannes and Birgitta's home together with a large number of senior Galactic astronomers and sit down to an informal and lovely dinner, showing that it is indeed feasible to be a personable man, an excellent scientist and a good cook at the same time.

Because of their long-standing links with Chinese astronomy, it is particularly appropriate to dedicate IAU Symposium 298 to Johannes and Birgitta. Many Chinese astronomers that are now in their middle age benefited greatly from Johannes and Birgitta's teaching and guidance in their early years. They gave us opportunities to socialize with colleagues and meet new people from the fields that we were studying or interested in. Many Chinese astronomers, including one of us (GZ), take delight in talking about their interesting past with Johannes and Birgitta when recalling the unforgettable memories.

*On behalf of the SOC, Sofia Feltzing and Gang Zhao, co-chairs
Lund and Beijing, 22 August 2013*

Address by the Local Organizing Committee

Dear colleagues and friends,

On behalf of the Local Organizing Committee of the 298th Symposium of the International Astronomical Union, it is our great pleasure to welcome all of you. We are heading to a whole new era of Galactic Astronomy, taking advantage of large-scale ground-based surveys including LAMOST, and the unprecedented astrometric satellite Gaia. By organizing this symposium, we are hoping that it would help strengthen the communications among the community, being ready for the upcoming challenges and excitements.

We acknowledge financial and organizational support from several institutions and companies: the International Astronomical Union, the Chinese Academy of Sciences, National Natural Science Foundation of China, National Astronomical Observatories of Chinese Academy of Sciences, Yunnan Astronomical Observatory of Chinese Academy of Sciences, Astrium, and Lijiang Government of Yunnan Province, China.

It is also a very special occasion where the symposium is dedicated to Birgitta Nordström and Johannes Andersen, two outstanding people in this community, and closest friends of Chinese astronomers as well. It is really great to have both of them here with us.

Lijiang is one of the wonderlands maintaining natural and historical beauty at the same time. It is a bonus that this amazing place is closely connected to astronomy. Lijiang not only has two asteroids named after it, but also has its own observatory now. We believe that this symposium will become an important moment in the history of Lijiang's astronomy.

Thank you very much, and please enjoy your stay here.

*Zhanwen Han, Haining Li, and Yujuan Liu (Co-chairs LOC)
Lijiang, China, May 20, 2013*

Welcome Speech at the 298th Symposium of IAU

Good morning, ladies and gentleman, dear friends and colleagues,

I am very pleased to be here, opening the No. 298 Symposium of IAU. First of all, please allow me to extend a warm welcome to all of you, on behalf of the SOC, and the National Astronomical Observatories of the Chinese Academy of Sciences. I also want to express our great appreciation to all funding agencies and sponsors, for supporting this symposium, and also to all SOC and LOC members for their great efforts in organizing this event.

Near-field cosmology, namely detailed study of the Milky Way and its close neighbors, can provide strong constraints on models of galaxy formation and evolution, thus is crucial to modern astrophysics. With the upcoming astrometric satellite Gaia and large scale ground based surveys like LAMOST, Galactic Astronomy enters a new era. We will have access to high quality data of several millions of stars, which will no doubt raise new challenges to Galactic astronomers. This symposium is conceived out of a need to prepare the community for the challenges ahead, to foster stronger relations between observers and modelers, and ultimately, to create and understand the detailed map of our Galaxy.

The past decade has witnessed significant progress in China's astronomy, with the successive establishment and operation of optical, radio and millimeter telescopes developed by Chinese astronomers. The National Key Science Facility Guoshoujing telescope, also known as LAMOST has started its regular survey since last autumn. Moreover, China is also actively planning for future major research facilities, and participation in international ground and space programs. This symposium would open-up a great stage for mutual understanding and exchanges between us and colleagues from all over the world working in similar fields.

This symposium is dedicated to Birgitta Nordström and Johannes Andersen, for their numerous contributions to Galactic astronomy, and in particular, their vital roles in the Geneva-Copenhagen Survey and the IAU activities. Birgitta and Johannes have been really close friends with many astronomers for many years. I am pretty sure that this is an important reason why many participants here come to join this symposium.

Lijiang city, is one of the most time-honored and nature-beautiful places in China. It also holds natural advantage for astronomical observation. An observatory and a 2.4-meter telescope have already been established here. The main instrument attached to this 2.4m telescope is YFOSCO, to which Johannes and his team made a great contribution. We are also grateful for the staff of Lijiang observatory for their help on LOC service for the symposium.

By bringing together all of you theoreticians, observers, and survey scientists, we wish to maximize the impact of this symposium, which is to encourage and excite, to lead to new insights and a community better prepared to take scientific advantage of Gaia, LAMOST and all the large on-going or upcoming surveys.

I hope you will enjoy your stay in Lijiang, and I look forward to your talks and stimulating exchanges of views. Thank you!

*On behalf of the SOC, Gang Zhao, co-chair
Lijiang, China, 20 May 2013*

