

IAU Symposium

282

18 - 22 July 2011

2011

Tatranská Lomnica,  
Slovakia

IAU Symposium

282

18 - 22 July 2011

Tatranská Lomnica, Slovakia

Proceedings of the International Astronomical Union

# From Interacting Binaries to Exoplanets: Essential Modeling Tools

From Interacting

Binaries to

Exoplanets:

Essential Modeling

Tools

*Edited by*

Richards  
Hubeny

Mercedes T. Richards  
Ivan Hubeny



ISSN 1743-9213

Proceedings of the  
International  
Astronomical Union



International Astronomical Union



CAMBRIDGE

CAMBRIDGE  
UNIVERSITY PRESS

FROM INTERACTING BINARIES TO EXOPLANETS:  
ESSENTIAL MODELING TOOLS

IAU SYMPOSIUM No. 282

*COVER ILLUSTRATION:* Môj rodný kraj: My native land

The cover photograph of the High Tatra Mountains in Slovakia is entitled “Môj rodný kraj” (“My native land”) and was taken by Stanislav Dubik ©2011 stano dubik [1970] (<http://sdphoto.acompp.sk/>).

IAU SYMPOSIUM PROCEEDINGS SERIES  
2011 EDITORIAL BOARD

*Chairman*

THIERRY MONTMERLE, IAU Assistant General Secretary  
*Institut d'Astrophysique de Paris,  
98bis, Bd Arago, 75014 Paris, France  
montmerle@iap.fr*

*Advisers*

IAN F. CORBETT, IAU General Secretary,  
*European Southern Observatory, Germany*

UTA GROTHKOPF, *European Southern Observatory, Germany*

CHRISTIANN STERKEN, *Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussels, Belgium*

*Proceedings Editors*

IAUS 278

Archaeoastronomy and Ethnoastronomy: Building Bridges Between Cultures  
C. L. N. RUGGLES, *University of Leicester, School of Archaeology and Ancient History,  
University Rd, Leicester LE1 7RH, United Kingdom*

IAUS 279

Death of Massive Stars: Supernovae and Gamma-Ray Bursts [*postponed to 2012*]  
P. ROMING, *Southwest Research Institute, Space Science & Engineering Division,  
P.O. Drawer 28510, San Antonio, TX 78228-0510, USA*

IAUS 280

The Molecular Universe

J. CERNICCHARO, *Depto. de Astrofísica, Centro de Astrobiología, Crta. Torrejón Km 4,  
28850 Torrejón de Ardoz, Madrid, Spain*

IAUS 281

Binary Paths to the Explosions of type Ia Supernovae

R. DI STEFANO, *Harvard-Smithsonian Center for Astrophysics, 60 Garden Street,  
Cambridge, MA 02138, USA*

IAUS 282

From Interacting Binaries to Exoplanets: Essential Modeling Tools

M. RICHARDS, *Pennsylvania State University, Dept. of Astronomy & Astrophysics,  
525 Davey Lab, University Park, PA 16802, USA*

IAUS 283

Planetary Nebulae: an Eye to the Future

A. MANCHADO, *Instituto de Astrofísica de Canarias, Calle Vía Láctea s/n,  
38200 La Laguna, Tenerife, Spain*

IAUS 284

The Spectral Energy Distribution of Galaxies (SED2011)

R. J. TUFFS, *MPI für Kernphysik, Astrophysics Dept, Saupfercheckweg 1, 69117 Heidelberg,  
Germany*

IAUS 285

New Horizons in Time Domain Astronomy

E. GRIFFIN, *NRC Herzberg Institute of Astrophysics, 5071 W Saanich Rd, Victoria, BC,  
V9E 2E7, Canada*

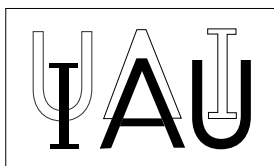
IAUS 286

Comparative Magnetic Minima: Characterizing Quiet Times in the Sun and Stars

C. MANDRINI, *Instituto de Astronomía y Física del Espacio, CC. 67 Suc. 28,  
1428 Buenos Aires, Argentina*

INTERNATIONAL ASTRONOMICAL UNION  
UNION ASTRONOMIQUE INTERNATIONALE

International Astronomical Union



**FROM INTERACTING  
BINARIES TO EXOPLANETS:  
ESSENTIAL MODELING  
TOOLS**

**PROCEEDINGS OF THE 282<sup>nd</sup> SYMPOSIUM OF THE  
INTERNATIONAL ASTRONOMICAL UNION  
HELD IN TATRANSKÁ LOMNICA, SLOVAKIA  
JULY 18–22, 2011**

Edited by

**MERCEDES T. RICHARDS**

*Pennsylvania State University, University Park, PA, USA*

and

**IVAN HUBENY**

*University of Arizona, Steward Observatory, Tucson, AZ, USA*



**CAMBRIDGE  
UNIVERSITY PRESS**



CAMBRIDGE UNIVERSITY PRESS

The Edinburgh Building, Cambridge CB2 2RU, United Kingdom  
32 Avenue of the Americas, New York, NY 10013-2473, USA  
10 Stamford Road, Oakleigh, Melbourne 3166, Australia

© International Astronomical Union 2012

This book is in copyright. Subject to statutory exception  
and to the provisions of relevant collective licensing agreements,  
no reproduction of any part may take place without  
the written permission of the International Astronomical Union.

First published 2012

Printed in the United Kingdom at the University Press, Cambridge

Typeset in System L<sup>A</sup>T<sub>E</sub>X 2 $\epsilon$

*A catalogue record for this book is available from the British Library*

*Library of Congress Cataloguing in Publication data*

This journal issue has been printed on FSC-certified paper and cover board. FSC is an independent, non-governmental, not-for-profit organization established to promote the responsible management of the world's forests. Please see [www.fsc.org](http://www.fsc.org) for information.

ISBN 9781107019829 hardback

ISSN 1743-9213

## Table of Contents

Preface .....	xvi
Organizing committees .....	xx
Conference photograph .....	xxi
Conference participants .....	xxix
Address by the Scientific Organizing Committee .....	xxxix
<i>Mercedes T. Richards and Ivan Hubeny</i>	

## Opening Address

Shaking the Pot of Modeling Tools: Some Open Problems in the Field .....	1
<i>P. Harmanec</i>	

## 1. Multiwavelength Photometry and Spectroscopy of Interacting Binaries

Advances in Telescope and Detector Technology - Impacts on the Study and Understanding of Binary Star and Exoplanet Systems .....	11
<i>E. F. Guinan, S. Engle, and E. J. Devlin</i>	
Ground-Based and Space Observations of Interacting Binaries .....	21
<i>P. Niarchos</i>	
Techniques for Observing Binaries in Other Galaxies .....	27
<i>A. Z. Bonanos</i>	
The Impact of Gaia and LSST on Binaries and Exoplanets .....	33
<i>L. Eyer, P. Dubath, N. Mowlavi, P. North, A. Triaud, F. Barblan, C. Siopis, L. Guy, B. Tingley, S. Zucker, D. W. Evans, L. Wyrzykowski, M. Sweges, and Z. Ivezić</i>	
The Impact of CoRoT and Kepler on Eclipsing Binary Science .....	41
<i>C. Maceroni, D. Gandolfi, J. Montalbán, and C. Aerts</i>	
Use of the Virtual Observatory Databases in Binary Star Research .....	47
<i>G. J. Peters</i>	
Multi-Technique Study of the X-Ray Binary Cyg X-1 .....	53
<i>E. A. Karitskaya</i>	
Light Curve and Orbital Period Analysis of the Eclipsing Binary AT Peg .....	55
<i>A. Liakos, P. Niarchos, and E. Budding</i>	
The Third Body in the Eclipsing Binary AV CMi: Hot Jupiter or Brown Dwarf? .....	57
<i>A. Liakos, D. Mislis, and P. Niarchos</i>	

Multiwavelength Photometry of the Young Intermediate Mass Eclipsing Binary TY CrA . . . . .	59
<i>M. Ammler-von Eiff, M. Vaňko, T. Pribulla, E. Covino, R. Neuhäuser, and V. Joergens</i>	
Eccentricity of Selected Eclipsing Systems. . . . .	61
<i>W. Ogłozza, J. M. Kreiner, G. Stachowski, B. Zakrzewski, Z. Mikulášek, and M. Zejda</i>	
Reconstruction of an Accretion Disk Image in AU Mon from CoRoT Photometry . . . . .	63
<i>P. Mimica and K. Pavlovski</i>	
Multiwavelength Modeling the SED of Strongly Interacting Binaries . . . . .	65
<i>A. Skopal</i>	
Spectroscopic Study of the Early-Type Binary HX Vel A . . . . .	67
<i>B. Özkardes, D. Sürgit, A. Erdem, E. Budding, F. Soyduğan and O. Demircan</i>	
Planets in Binary Systems. . . . .	69
<i>A. Pilello</i>	
Northern Binaries in the Evrena Project . . . . .	71
<i>V. Bakış, H. Hensberge, M. Zejda, P. de Cat, F. Yılmaz, S. Bloemen, P. Svoboda, and O. Demircan</i>	
Statistical Investigation of Physical and Geometrical Parameters in Close Binaries using the ASAS Database . . . . .	73
<i>J. Nedoroščík, M. Vaňko, and Š. Parimucha</i>	
Some Developments of the Weak Stellar Magnetic Field Determination Method for the Example of Cygnus X-1 . . . . .	75
<i>N. G. Bochkarev and E. A. Karitskaya</i>	
KIC 4544587: An Eccentric, Short Period Binary with $\delta$ Scuti Pulsations and Tidally Excited Modes. . . . .	77
<i>K. Hambleton, D. Kurtz, A. Prša, S. Bloemen, and J. Southworth</i>	
Long-Term Variability and Outburst Activity of FS Aurigae: Further Evidence for a Third Body in the System . . . . .	79
<i>V. Neustroev, G. Sjöberg, G. Tovmassian, S. Zharikov, T. Arranz Heras, P. B. Lake, D. Lane, G. Lubcke, and A. A. Henden</i>	
SPHOTO – Package for an Automatic Multicolour Photometry . . . . .	81
<i>Š. Parimucha, M. Vaňko, and P. Mikloš</i>	
The Photometric Study of Neglected Short-Period Eclipsing Binary BS Vulpeculae . . . . .	83
<i>M. Zejda, Z. Mikulášek, L. Zhu, S. Qian, and J. Liška</i>	
O-C Analysis of Selected 3-Body Systems . . . . .	85
<i>W. Ogłozza, J. M. Kreiner, G. Stachowski, M. Winiarski, B. Zakrzewski, S. Doğru, F. Aliçavuş, O. Demircan, and A. Erdem</i>	
Hard X-ray and Optical Activity of Intermediate Polars . . . . .	87
<i>R. Gális, L. Hric, and E. Kundra</i>	

Is EQ Boo a Quadruple System? . . . . .	89
<i>I. M. Volkov, D. Chochol, N. S. Volkova, and I. V. Nikolenko</i>	
Long-Term Monitoring of Polars. . . . .	91
<i>B. Kalomeni</i>	
The Apsidal Motion of the Eclipsing Binary Systems GSC 4487 0347 and GSC 4513 2537 . . . . .	93
<i>V. S. Kozyreva, A. V. Kusakin, T. Krajci, J. Menke, and T. M. Tsvetkova</i>	
Recent Spectral Observations of Epsilon Aurigae in the Near-IR . . . . .	95
<i>L. Iliev</i>	

## 2. Observations and Analysis of Exoplanets and Brown Dwarfs

Challenges to Observations of Low Mass Binaries. . . . .	99
<i>S. Kafka</i>	
Brown Dwarf Binaries . . . . .	105
<i>K. Allers</i>	
Detecting and Characterizing Exoplanets in Binary Star Systems . . . . .	111
<i>M. Konacki</i>	
Probing Bow Shocks Around Exoplanets During Transits . . . . .	117
<i>A. A. Vidotto, M. Jardine, and C. Hellwig</i>	
The Impact of Red Noise in Radial Velocity Planet Searches . . . . .	119
<i>R. V. Baluev</i>	
Pre-Cataclysmic System V471 Tau with Confirmed Brown Dwarf and Suspected Extrasolar Planet . . . . .	121
<i>L. Hric and E. Kundra</i>	
The Orbital Period Distribution of Cataclysmic Variables Found by the SDSS. . . . .	123
<i>J. Southworth, B. T. Gänsicke, and E. Breedt</i>	
Search for the Star-Planet Interaction . . . . .	125
<i>T. Krejčová, J. Budaj, and J. Koza</i>	
An Extra-Solar Planet in a Double Stellar System: The Modelling of Insufficient Orbital Elements . . . . .	127
<i>E. Plávalová, N. A. Solovaya, and E. M. Pittich</i>	
Space-Based Photometry of Eclipsing Binaries . . . . .	129
<i>J. Southworth</i>	
Homogeneous Studies of Transiting Planets . . . . .	131
<i>J. Southworth</i>	
Light Curves of Planetary Transits: How About Ellipticity? . . . . .	133
<i>C. von Essen, K. F. Huber, and J. H. M. M. Schmitt</i>	

New Photometric Observations of the Transiting Extrasolar Planet TrES-3b . . .	135
<i>M. Vaňko, M. Jakubík, T. Krejčová, G. Maciejewski, J. Budaj, T. Pribulla, J. Ohlert, S. Raetz, V. Krushevska, and P. Dubovsky</i>	
Stellar Wobble Due to a Nearby Binary System . . . . .	137
<i>M. H. M. Morais and A. C. M. Correia</i>	
Asymmetric Transit Curves as Indication of Orbital Obliquity: Clues from the Brown Dwarf Companion in KOI-13. . . . .	139
<i>G. M. Szabó, R. Szabó, J. M. Benkő, H. Lehmann, G. Mező, A. E. Simon, Z. Kővári, G. Hodosán, Z. Regály, and L. L. Kiss</i>	
Multiband Transit Light Curve Modeling of WASP-4 . . . . .	141
<i>N. Nikolov, J. Koppenhoefer, M. Lendl, T. Henning, and J. Greiner</i>	
New Binary and Exoplanet Candidates from STEREO Light Curves. . . . .	143
<i>G. Whittaker, V. Sangaralingam, and I. Stevens</i>	

## Panel Discussion I

Discussion I. . . . .	145
<i>F. Allard, A. Batten, E. Budding, E. Devlinney, P. Eggleton, A. Hatzes, I. Hubeny, W. Kley, H. Lammer, A. Linnell, V. Trimble, and R. E. Wilson</i>	

## 3. Imaging Techniques

Binaries and Multiple Systems Observed with the CHARA, NPOI, SUSI and VLTI Interferometric Eyes . . . . .	155
<i>P. Stee</i>	
Observing Faint Companions Close to Bright Stars . . . . .	163
<i>E. Serabyn</i>	
Tomography of Interacting Binary Systems: Algols to Gamma-Ray Binaries. . . . .	167
<i>M. T. Richards</i>	
Polarimetry of Binary Stars and Exoplanets . . . . .	173
<i>K. Bjorkman</i>	
Adaptive Optics Observations of Exoplanets, Brown Dwarfs, and Binary Stars . . . . .	181
<i>S. Hinkley</i>	
Mass Determination of Sub-stellar Companions Around Young Stars - The Example of HR 7329 . . . . .	189
<i>T. O. B. Schmidt, R. Neuhauser, and A. Seifahrt</i>	
Lucky Imaging Survey for Binary Exoplanet Hosts . . . . .	193
<i>C. Bergfors, W. Brandner, S. Daemgen, and T. Henning</i>	
Pipeline for Making Images of Gas Flows in Binary Stars . . . . .	195
<i>M. T. Richards, E. Slobounov, M. Conover, J. Fisher, and A. Cocking</i>	

Differential Rotation in Two RS CVn Systems: $\sigma$ Gem and $\zeta$ And. . . . .	197
<i>Z. Kóvári, J. Bartus, L. Kriskovics, K. Oláh, K. Vida, O. Ribárik, and K. G. Strassmeier</i>	
Modelling of an Eclipsing RS CVn Binary: V405 And. . . . .	199
<i>K. Vida, K. Oláh, and Z. Kóvári</i>	
Doppler Tomography in 2D and 3D of the X-ray Binary Cyg X-1 for June 2007 . . . . .	201
<i>O. I. Sharova, M. I. Agafonov, E. A. Karitskaya, N. G. Bochkarev, S. V. Zharikov, G. Z. Butenko, and A. V. Bondar</i>	
PTPS Candidate Exoplanet Host Star Radii Determination with CHARA Array . . . . .	203
<i>P. Zielinski, M. Vaňko, E. Baines, A. Niedzielski, and A. Wolszczan</i>	
The MUNI Photometric Archive. . . . .	205
<i>M. Chrastina, M. Zejda, and Z. Mikulášek</i>	
Eclipsing Binaries Within Visual Ones: Prospects of Combined Solution . . . . .	207
<i>P. Zasche</i>	
Polarimetry of Exoplanetary System CoRoT-2 . . . . .	209
<i>N. M. Kostogryz, T. M. Yakobchuk, and A. P. Vidmachenko</i>	

## 4. Model Atmospheres of Stars, Interacting Binaries, Disks, Exoplanets, and Brown Dwarfs

LTE Model Atmospheres: MARCS, ATLAS and CO5BOLD. . . . .	213
<i>P. Bonifacio, E. Caffau, H.-G. Ludwig, and M. Steffen</i>	
Basic Tools for Modeling Stellar and Planetary Atmospheres . . . . .	221
<i>I. Hubeny</i>	
Hot Stars with Winds: The CMFGEN Code . . . . .	229
<i>D. J. Hillier</i>	
Stellar to Substellar Model Atmospheres . . . . .	235
<i>F. Allard, D. Homeier, and B. Freytag</i>	
Comparison of Limb-Darkening Laws from Plane-Parallel and Spherical Model Stellar Atmospheres . . . . .	243
<i>H. R. Neilson</i>	
Modeling of Circumstellar Dust by the DUSTY Code . . . . .	247
<i>T. Jurkić and D. Kotnik-Karuza</i>	
Modeling Supernova Spectra. . . . .	251
<i>D. J. Hillier, L. Dessart, and C. Li</i>	
Polarized Radiative Transfer Equation in Some Geometries of Elliptic Type. . . . .	253
<i>J. Freimanis</i>	
Influence of Rotation Velocity Gradient on Line Profiles of Accretion Discs of CVs . . . . .	255
<i>D. Korčáková, T. Nagel, K. Werner, V. Suleimanov, and V. Votruba</i>	



Hydrodynamics of Decretion Disks of Rapidly Rotating Stars. . . . .	257
<i>P. Kurfürst</i>	
Multi-dimensional Modeling of Massive Binary Interaction in Eta Carinae . . . . .	259
<i>J. H. Groh</i>	
Modeling of the Be Stars. . . . .	261
<i>K. Šejnová, V. Votruba, and P. Koubský</i>	
Fitting of Silicon lines in UV and Balmer H $\delta$ Line in Optical Spectra of B supergiant HD 198478 . . . . .	263
<i>T. Jurkić, M. Sarta Deković, and D. Kotnik-Karuza</i>	
Creation of Neutral Disk-like Zone around the Active Hot Star in Symbiotic Binaries. . . . .	265
<i>Z. Cariková and A. Skopal</i>	
New Galactic Candidate Luminous Blue Variables and Wolf-Rayet Stars . . . . .	267
<i>G. S. Stringfellow, V. V. Gvaramadze, Y. Beletsky, and A. Y. Kniazev</i>	

## 5. Synthetic Light Curves and Velocity Curves, Synthetic Spectra of Binary Stars and their Accretion Structures

Advances in Modeling Eclipsing Binary Stars in the Era of Large All-Sky Surveys with EBAI and PHOEBE . . . . .	271
<i>A. Prša</i>	
ROCHE: Analysis of Eclipsing Binary Multi-Dataset Observables . . . . .	279
<i>T. Pribulla</i>	
The BINSYN Program Suite. . . . .	283
<i>A. P. Linnell</i>	
Application of the GDDSYN Method in the Era of KEPLER, CoRoT, MOST and BRITTE. . . . .	287
<i>S. W. Mochnacki</i>	
Synthetic Spectra and Light Curves of Interacting Binaries and Exoplanets with Circumstellar Material: SHELLSPEC. . . . .	293
<i>J. Budaj</i>	
Search for Tidally Driven Anomalies in the Atmospheres of Am Stars. . . . .	299
<i>I. Stateva, I. Iliev, and J. Budaj</i>	
RaveSpan - Radial Velocity and Spectrum Analyzer . . . . .	301
<i>B. Pilecki, P. Konorski, and M. Gorski</i>	
Chemical History of Algol and its Components. . . . .	303
<i>V. Kolbas, K. Pavlovski, J. Southworth, C.-U. Lee, J. W. Lee, S.-L. Kim, and H.-I. Kim</i>	
Infinity – A New Program for Modeling Binary Systems . . . . .	305
<i>C. Attila and O. Latković</i>	

Fundamental Parameters of Four Massive Eclipsing Binaries in Westerlund 1 . . .	307
<i>E. Koumpia and A. Z. Bonanos</i>	
Is the B[e] Star V2028 Cyg a Binary? . . . . .	309
<i>J. Polster, D. Korčáková, V. Votruba, P. Škoda, M. Šlechta and B. Kučerová</i>	
Peculiarities in the Spectrum of the Early-type System MY Ser . . . . .	311
<i>P. Mayer, H. Drechsel, and M. Brož</i>	
Period Changes of the Algol System SZ Herculis . . . . .	313
<i>J. W. Lee, C.-U. Lee, S.-L. Kim, H.-I. Kim, J.-H. Park, and T. C. Hinse</i>	
The Role of Electron Scattering in Probing the Wind from the Hot Star in Symbiotic Binaries . . . . .	315
<i>M. Sekeráš and A. Skopal</i>	
Optical Spectroscopy of V393 Scorpii During its Long Cycle. . . . .	317
<i>R. E. Mennickent, Z. Kołaczowski, G. Djurasevic, M. Diaz, and E. Niemczura</i>	
Methods of the Long-term Radial-Velocity Variation Removal and their Application to Detect Duplicity of Several Be Stars . . . . .	319
<i>J. Nemravová, P. Harmanec, P. Koubský, and A. Miroshnichenko</i>	
Advanced Tools for Exploring Large EB Datasets . . . . .	321
<i>E. J. Devlinney, A. Prša, E. F. Guinan, and M. Degeorge</i>	
Applying the Steepest Descent Method with BINSYN on RY Per Photometry . .	323
<i>D. Sudar, H. Božić, and D. Ruždjak</i>	
The Effects of Eccentric Accretion Structures on the Light Curves of Interacting Algol-type Binary Stars . . . . .	325
<i>P. A. Reed</i>	
Physical Parameters of the Detached Eclipsing Binary KIC3858884 with a $\delta$ -Scuti Type Pulsating Component . . . . .	327
<i>C.-U. Lee, S.-L. Kim, J. W. Lee, K. Pavlovski, and J. Southworth</i>	
New Light Curve Analysis for Large Numbers of Eclipsing Binaries III. SMC and Galactic Center. . . . .	329
<i>Y.-W. Kang, K. S. Hong, and P. Rittipruk</i>	
Mass and Orbit Constraints of the Gamma-ray Binary LS 5039 . . . . .	331
<i>T. Szalai, G. E. Sarty, L. L. Kiss, J. M. Matthews, J. Vinkó, and C. Kiss</i>	
Spectroscopic Binaries Among $\lambda$ Bootis-type Stars. . . . .	333
<i>E. Paunzen, L. Fraga, U. Heiter, I. Iliev, I. Kamp, and O. Pintado</i>	
Characterizing New Eclipsing Binaries Identified from STEREO Photometry . . .	335
<i>H. Markov, Z. Tsvetanov, I. Iliev, I. Stateva, and N. Markova</i>	
Modelling Light Curves of Systems with Non-Circular Accretion Disks: KU Cyg	337
<i>S. Zola and T. Szymanski</i>	
Towards an Increased Accuracy of Fundamental Properties of Stars: Proposing a Set of Nominal Astrophysical Parameters and Constants . . . . .	339
<i>A. Prša and P. Harmanec</i>	

## Panel Discussion II

Discussion II . . . . .	341
<i>F. Allard, A. Batten, E. Budding, E. Devlinney, P. Eggleton, A. Hatzes, I. Hubeny, W. Kley, H. Lammer, A. Linnell, V. Trimble, and R. E. Wilson</i>	

## 6. Analysis of Spectra and Light Curves

The Disentangling of Stellar Spectra . . . . .	351
<i>P. Hadrava</i>	
Quantitative Spectroscopy of Close Binary Stars . . . . .	359
<i>K. Pavlovski and J. Southworth</i>	
The Broadening Functions Technique . . . . .	365
<i>S. M. Rucinski</i>	
TODCOR - Two Dimensional Correlation . . . . .	371
<i>S. Zucker</i>	
The Long History of the Rossiter-McLaughlin Effect and its Recent Applications	379
<i>S. Albrecht</i>	
The Rossiter McLaughlin Effect for Planets and Low Mass Binaries . . . . .	385
<i>A. H. M. J. Triaud</i>	
Period Analyses Without O-C Diagrams . . . . .	391
<i>Z. Mikulášek, M. Zejda, and J. Janík</i>	
Renormalization of KOREL-Decomposed SB2 Spectra . . . . .	395
<i>H. Lehmann and A. Tkachenko</i>	
The BANANA Survey: Spin-Orbit Alignment in Binary Stars . . . . .	397
<i>S. Albrecht, J. N. Winn, D. C. Fabrycky, G. Torres, and J. Setiawan</i>	
A Search for the Secondary Spectrum of $\epsilon$ Aurigae . . . . .	399
<i>P. D. Bennett, P. Harmanec, P. Chadima, and S. Yang</i>	
An Unexpected Outcome from Disentangling . . . . .	401
<i>P. Chadima, P. Harmanec, P. D. Bennett, and S. Yang</i>	
VO-KOREL: A Fourier Disentangling Service of the Virtual Observatory . . . . .	403
<i>P. Škoda, P. Hadrava, and J. Fuchs</i>	
Constrained Genetic Disentangling of Close Binary Spectra . . . . .	405
<i>V. Kolbas and K. Pavlovski</i>	

## 7. Formation and Evolution of Binary Stars, Brown Dwarfs, and Planets

Binary Star Formation Simulations . . . . .	409
<i>C. J. Clarke</i>	
Non-conservative Evolution of Binaries . . . . .	417
<i>C. A. Tout</i>	

Direct Imaging of Bridged Twin Protoplanetary Disks in a Young Multiple Star <i>S. Mayama, M. Tamura, T. Hanawa, T. Matsumoto, M. Ishii, T.-S. Pyo, H. Suto, T. Naoi, T. Kudo, J. Hashimoto, S. Nishiyama, M. Kuzuhara, and M. Hayashi</i>	425
Formation and Orbital Evolution of Planets . . . . . <i>W. Kley</i>	429
Towards a Theory for the Atmospheres, Structure, and Evolution of Giant Exo- planets. . . . . <i>A. Burrows</i>	437
Eclipse Timing Variations of Planets in P-Type Binary Star Systems . . . . . <i>R. Schwarz, N. Haghighipour, B. Funk, S. Ettl, and E. Pilat-Lohinger</i>	444
New Insights into the Dynamics of Planets in P-Type Motion Around Binaries . <i>B. Funk, S. Ettl, M. Gyergovits, R. Schwarz, and E. Pilat-Lohinger</i>	446
Dependence of Circumstellar Disk SEDs on System Inclination . . . . . <i>O. Zakhovay</i>	448
Planetary Dynamics in the $\alpha$ Centauri System: Lyapunov Spectra and Long-term Behaviour . . . . . <i>E. A. Popova and I. I. Shevchenko</i>	450
T Tauri Binaries in Orion: Evidence for Accelerated and Synchronized Disk Evo- lution. . . . . <i>S. Daemgen, M.G. Petr-Gotzens, and S. Correia</i>	452
Variability of Young Massive Stars in the Arches Cluster . . . . . <i>K. Markakis, A. Z. Bonanos, G. Pietrzynski, L. Macri, and K. Z. Stanek</i>	454
The Evolution of Low Mass Contact Binaries . . . . . <i>K. Stepień and K. Gazeas</i>	456
Kinematic Properties of Chromospheric Active Binary Stars. . . . . <i>M. Tüysüz, F. Soyduğan, S. Bilir, and O. Demircan</i>	458
The AstraLux Binary M Dwarfs Survey . . . . . <i>C. Bergfors, W. Brandner, S. Hippler, T. Henning, M. Janson, and F. Hormuth</i>	460
Binary Systems Within Star Clusters. . . . . <i>E. Paunzen, C. Stütz, and B. Baumann</i>	462
Age Dependent Angular Momentum, Orbital Period and Total Mass of Detached Binaries . . . . . <i>O. Demircan, M. Tüysüz, F. Soyduğan, and S. Bilir</i>	464
Li and Be Depletion in Stars with Exoplanets? . . . . . <i>E. Delgado Mena, G. Israelian, J. I. González Hernández, R. Rebolo, N. C. Santos, S. G. Sousa, and J. Fernandes</i>	466

Binary Systems As Gravitational Wave Sources . . . . .	468
<i>O. Köse and K. Yakut</i>	
Photoionization Models of the Eskimo Nebula: Evidence for a Binary Central Star? . . . . .	470
<i>A. Danehkar, D. J. Frew, Q. A. Parker, and O. De Marco</i>	
The Keck I/HIRES and TNG/SARG Radial Velocity Survey of Speckle Binaries . . . . .	472
<i>M. Ratajczak, M. Konacki, S. R. Kulkarni, and M. W. Muterspaugh</i>	
New Approach for Solution of the Planet Transit Problem . . . . .	474
<i>D. P. Kjurkchieva and D. P. Dimitrov</i>	
The Origin and Evolution of the Black Hole Binary XTE J1118+480 . . . . .	476
<i>J. I. González Hernández, R. Rebolo, and J. Casares</i>	
Magnetic Activity of Two Similar Subgiants in Binaries with Very Different Mass Ratios: EI Eri and V711 Tau. . . . .	478
<i>K. Oláh, Z. Kóvári, K. Vida, and K. G. Strassmeier</i>	
Searching for the Signatures of Terrestrial Planets in “Hot” Analogs . . . . .	480
<i>J. I. González Hernández, E. Delgado Mena, G. Israelian, S. G. Sousa, N. C. Santos, and S. Udry</i>	
Calibrating Ultracool Atmospheres with Benchmark Companions from WISE+2MASS . . . . .	482
<i>J. I. Gomes, D. Pinfield, A. Day-Jones, H. Jones, B. Burningham, F. Marocco, Z. Zhang, and L. van Spaandonk</i>	
First Catalogue of Optically Variable Sources Observed by OMC Onboard INTEGRAL . . . . .	484
<i>J. Alfonso-Garzón, A. Domingo, and J. Miguel Mas-Hesse</i>	
Day-Night Side Cooling of a Strongly Irradiated Giant Planet . . . . .	486
<i>J. Budaj, A. Burrows, and I. Hubeny</i>	
NSVS 01031772 Cam: A New Low-Mass Triple? . . . . .	490
<i>M. Wolf, P. Zasche, K. Hornoch, M. Chrastina, J. Janík, and M. Zejda</i>	
CCD Photometric Study of the Puzzling W UMa-type Binary TZ Boo . . . . .	492
<i>P.-E. Christopoulou, A. Papageorgiou, and I. Chrysopoulos</i>	
Structure Coefficients for Use in Stellar Analysis . . . . .	494
<i>G. Inlek and E. Budding</i>	
Surface Brightness Variation of the Contact Binary SW Lac: Clues From Doppler Imaging . . . . .	496
<i>H. V. Şenavcı</i>	
An Unusual Low State of the Polar AR UMa . . . . .	498
<i>D. P. Kjurkchieva and D. V. Marchev</i>	
<b>Panel Discussion III</b>	
Discussion III . . . . .	501
<i>F. Allard, A. Batten, E. Budding, E. Devlinney, P. Eggleton, A. Hatzes, I. Hubeny, W. Kley, H. Lammer, A. Linnell, V. Trimble, and R. E. Wilson</i>	

## 8. Hydrodynamic Simulations of Exoplanets and Mass Transfer in Interacting Binaries

Flow Structure in Magnetic CVs . . . . .	509
<i>D. V. Bisikalo and A. G. Zhilkin</i>	
How Common Envelope Interactions Change the Lives of Stars and Planets . . . .	517
<i>O. De Marco, J.-C. Passy, F. Herwig, C. L. Fryer, M.-M. Mac Low, and J. S. Oishi</i>	
Hydrodynamics of Young Binaries with Low-Mass Secondaries . . . . .	521
<i>T. Demidova, V. Grinin, and N. Sotnikova</i>	
Exoplanet Upper Atmosphere Environment Characterization . . . . .	525
<i>H. Lammer, K. G. Kislyakova, P. Odert, M. Leitzinger, M. L. Khodachenko, M. Holmström, and A. Hanslmeier</i>	
3D Models of Exoplanet Atmospheres . . . . .	533
<i>I. Dobbs-Dixon</i>	
Dynamical Stability and Habitability of Extra-solar Planets . . . . .	539
<i>E. Pilat-Lohinger</i>	
Gas Dynamic Simulation of the Star-Planet Interaction using a Binary Star Model	545
<i>D. E. Ionov, D. V. Bisikalo, P. V. Kaygorodov, and V. I. Shematovich</i>	
Gas Dynamic Simulations of Inner Regions of Protoplanetary Disks in Young Binary Stars . . . . .	547
<i>A. M. Fateeva, D. V. Bisikalo, P. V. Kaygorodov, and A. Yu. Sytov</i>	
Modeling Fluid Flow Effects in Close Binary and Protoplanetary Systems . . . .	549
<i>M. M. Montgomery</i>	

## Panel Discussion IV

Discussion IV . . . . .	551
<i>F. Allard, A. Batten, E. Budding, E. Devinney, P. Eggleton, A. Hatzes, I. Hubeny, W. Kley, H. Lammer, A. Linnell, V. Trimble, and R. E. Wilson</i>	

## Summary

Summary of Observational Techniques . . . . .	557
<i>P. Koubský</i>	
Summary of Theoretical Techniques . . . . .	562
<i>A. Burrows</i>	
Closing Remarks . . . . .	564
<i>M. Richards</i>	
Author Index . . . . .	565



## Preface

The conference entitled “From Interacting Binaries to Exoplanets: Essential Modeling Tools” is unique because it represents the first joint meeting between exoplanet and interacting binary star astronomers. The goals of the conference were primarily to bring these groups together to discuss the techniques that they have in common; to demonstrate the extent to which current computer programs are effective in modeling observations of interacting binary stars, brown dwarfs, and exoplanets; to identify ways to improve these codes by incorporating more detailed and realistic physics, while maximizing computer capacity; and to examine how to utilize active and proposed survey projects like Kepler, LSST, and Gaia to obtain data of the highest quality that can be modelled to extract optimal physical parameters, specifically to improve our understanding of the physics. The acceleration of discoveries of brown dwarfs and exoplanets and the rapid influx of very precise light curves from programs like CoRoT and Kepler provide additional stimuli for improving our modeling techniques. In summary, this conference focuses on the tools (imaging techniques, modeling codes, computational power) as they are applied to interacting binaries, brown dwarfs, and exoplanets. The study of binary stars is important because well over half of the stars in the sky belong to binaries, and they provide the only means of calculating stellar masses, which provide a direct link to their evolutionary histories. Moreover, some of the most interesting objects in the universe are found in interacting binaries, and some of these objects are used as standard candles to study the scale of the universe. Interacting binaries, including eclipsing and spectroscopic binaries, have also been used to test theories of stellar structure and evolution as well as general relativity. Besides the mass, they provide us with information about sizes, and even the shapes of stars. The star formation process will create binary or multiple star systems instead of planets based on the initial conditions of the nebula; and a recent study has shown that rocky planets tend to form more readily from nebulae containing a lot of dust. Moreover, stars with a planet or brown dwarf companion behave dynamically like binary star systems, so they share a common formation mechanism, differing only in the masses of the components. Hence, the connection between planetary systems and binary star systems is a natural one. Historically, the analytical tools and simulations used to model single stars were advanced for application to stars in binaries, then later to model interacting binaries and accretion disks. These techniques include astrometry, the radial velocity method, transits or eclipses, and timing studies, and they utilize stellar atmospheres models, as well as atomic and molecular data. Many of these procedures have been expanded to model the more complex low mass systems like brown dwarfs and exoplanets, especially those with Jupiter- and Earth-masses, and also to study the physics of the gas and dust involved in the formation of these systems. Recent observations show that planets can exist in binary star systems, and dynamical studies have shown that terrestrial planets around some close and wide binaries (with separations of several AU) can look similar to planets around a single star. So, planets could orbit one member of the pair, or each separately. This meeting will enhance our knowledge of the most effective tools for the study of brown dwarfs and exoplanets. Our understanding of binary and multiple systems has been driven simultaneously by observations and theory. Computational codes were developed to bridge the gap between these approaches and to permit the extraction of physical parameters that could perhaps uniquely describe the data. Over time, the modeling codes have not kept pace with our knowledge of the theory, partly because of computational constraints, and also because of the time and effort required to incorporate more realistic physics into the codes. As the accuracy of the

observations increases, carefully selected physical and astronomical constants need to be incorporated in the codes. For example, the solar mass and radius are used as constants in many calculations, so we need to adopt the most recent determinations of these constants. Simultaneously, various imaging tools have provided an important advance in the study of interacting binaries since nearly all of these systems are unresolved. Adaptive optics (e.g., AEOS), interferometry (e.g., CHARA, VLTI, NPOI), polarimetry, and Doppler tomography are already delivering an increasing number of resolved images of the active environments in these systems. Subsequently, these images will play an important role by providing viable constraints on the models. The ability to model single and binary stars has advanced substantially since the advent of the first model atmosphere codes (e.g., Kurucz 1970, SAO Special Report No. 309; Gustaffson 1971, *A&A*, 10, 187; Mihalas 1972, *ApJ*, 176, 139) and binary star synthesis codes (e.g., Wilson & Devinney 1971, *ApJ*, 66, 605). These computer programs have included physical processes that were as realistic as our computer technology could handle at that time. Forty years later, we have better models and computers and we need to take advantage of these advances (e.g., Hubeny, Mihalas & Werner 2003, *ASP Conf. Ser. Vol. 288*). Model atmosphere codes now include on the order of 108 atomic lines and 109 molecular lines for cool stars; and all 108 atomic lines are treated in non-LTE for hot stars. While these codes have evolved enormously, further improvements should include better microphysics to progress beyond the classical approximation of 1D plane-parallel, horizontally-homogeneous, static atmospheres. In the case of light curve, velocity curve, and spectral synthesis codes for binary star systems, the effects of limb darkening, gravity darkening, and the reflection effect have been incorporated for stars with spherical and Roche geometries. As our understanding of interacting binaries expanded, new codes were developed to model circumstellar structures like accretion disks, gas streams, winds, jets, and spots, in addition to stellar atmospheres and stellar pulsation. However, the distortional effects of rotation on the properties of high mass and rapidly rotating stars still need to be included in the models. Starting with the semi-analytical work of Lubow & Shu (1975, *ApJ*, 198, 383), numerical modeling of interacting binaries has advanced to full 3D hydrodynamic simulations (e.g., Bisikalo & Matsuda 2007, *IAU Symp. No. 240*, 356) that describe the accretion process in substantial detail based primarily on the assumption that gravitational forces dominate the gas flows. These simulations have been used effectively to derive the physical properties of the circumstellar gas (e.g., densities, temperatures, and velocities), and to study the processes of mass transfer and mass accretion assuming that the binary evolves under conservative conditions even though there may be substantial mass loss from the system. These processes will be the focus of our discussions, as well as active stages, instability in accretion disks, and oscillations. The effects of magnetic fields on the stars and circumstellar material should also be included in the simulations since there is now sufficient observational evidence that these fields will influence the evolution of the binary. Similar concerns apply to brown dwarfs and exoplanets. Substantial progress in our understanding of the observations can be achieved if we include more physical processes in the computer codes to achieve an enhancement in modeling that would be as monumental as the observational advances achieved in the last few decades. These advances are now feasible because computing power is growing at a rapid rate. Moreover, it will be possible to extract the maximum amount of information from the data once the theoretical models have been enhanced. Simultaneously, data need to be collected in a systematic way, at high resolution (in wavelength, orbital phase, spatial dimensions), within our galaxy and in external galaxies, and at multiple wavelengths to take advantage of observing facilities on the ground and in space (e.g., Gaia and LSST). Coordinated analyses encompassing several independent procedures simultaneously are now being used to demonstrate the

consistency of the models; e.g., synchronized photometric and spectroscopic analyses, comparison of data with synthetic models and hydrodynamic simulations. The topics of this conference are so central that they span at least four IAU Divisions, especially Divisions V (Variable Stars), IV (Stars), IX (Optical & Infrared Techniques), and III (Planetary Systems Sciences), as well as eight Commissions: C25 (Stellar Photometry & Polarimetry), C26 (Double & Multiple Stars), C27 (Variable Stars), C29 (Stellar Spectra), C36 (Theory of Stellar Atmospheres), C42 (Close Binary Stars), C53 (Extrasolar Planets), and C54 (Optical & Infrared Interferometry). The Working Groups on Active B Stars, Ap and Related Stars, and Extrasolar Planets are also pertinent to this conference. We received the official support of all four Divisions (V, III, IV, IX), all three WGs, and seven Commissions, including the essential Commissions C53 and C42. This support was influential in gaining the status of an IAU Symposium.

The conference was special because it officially linked the exoplanet and interacting binary star communities for the first time and the program truly reflected a blending of the two disciplines. In addition, the lectures included deeper examinations of the modeling codes than usual. Another innovation was the introduction of daily Panel Discussions to discuss the main lectures and to provide recommendations for future research directions.

The conference location in Slovakia was noteworthy because it is one of the places where codes have been created, and in a region where a substantial amount of the stellar astrophysics is still taught today. This meeting commemorated the 40th anniversary of the first model atmosphere and binary star synthesis codes, as well as the 110th anniversary of the birth of Dr. Antonín Bečvář, founder of the Skalnaté Pleso Observatory and author of several famous atlases and catalogues: *Atlas Coeli*, *Atlas Borealis*, *Atlas Eclipticalis* and *Atlas Australis* which were used nightly by astronomers around the world for almost half a century. The conference was advertised to the public on television, radio, and in the newspapers. The public was specifically invited to attend a public event including a lecture by Ivan Hubeny on “Hledání a studium planet mimo Sluneční soustavu” (Detecting and Studying Exoplanets). The presentation was given in the Town Hall in the nearby city of Poprad, and it was well received by the public.

We are delighted that the goals of the conference were fully achieved and we are grateful to all participants for their contributions to the success of the meeting. One hundred and seventy-seven participants from thirty-one countries attended the meeting and most participants of the conference characterized the meeting as extremely valuable and highly educational. The program contained forty-six invited and contributed lectures, in addition to the opening lecture and two summary lectures, plus fifty-seven mini-talks and one hundred and twenty-one posters. The invited speakers included those who have developed specialized modeling codes or who are active observers of exoplanets, brown dwarfs, and interacting binaries containing normal, chemically peculiar, and active stars. They were carefully selected to reflect gender and age balance and geographic distribution. Over 25% of the invited and contributed speakers were female, which reflects international representation.

We gratefully acknowledge financial support from the IAU, travel support provided to participants by many international organizations, logistical and administrative support from the Astronomical Institute of the Slovak Academy of Sciences, and financial support through discounts from many local businesses in the High Tatras region of Slovakia. We also thank Dr. Richard Komžík for serving as chief editor of the Abstract Book, developing and maintaining the conference web pages, managing the computer and audio-visual equipment for the presentations, and providing Internet access for participants. We are also grateful to Suzanne Richards for transcribing the discussion

sheets and to L'ubomír Hambálek and Alexander Cocking for transcribing the audio recordings.

*Mercedes T. Richards and Ivan Hubeny, SOC co-chairs,  
Theodor Pribulla and Ladislav Hric, LOC co-chairs  
Tatranská Lomnica, Slovakia, 19 August, 2011*



Dr. Antonín Bečvář (1901 – 1965)  
(Courtesy: Academy of Sciences of the Czech Republic)

## THE ORGANIZING COMMITTEES

### Scientific Organizing Committee

Dmitry Bisikalo (Russia)	Panagiotis Niarchos (Greece)
Ján Budaj (Slovakia)	Geraldine Peters (USA)
Osman Demircan (Turkey)	Theodor Pribulla (Slovakia)
Gojko Djurašević (Serbia)	Didier Queloz (Switzerland)
Edward F. Guinan (USA)	Mercedes T. Richards, co-chair (USA)
Petr Hadrava (Czech Republic)	Philippe Stee (France)
Petr Harmanec (Czech Republic)	Paula Szkody (USA)
Ladislav Hric (Slovakia)	Juraj Zverko (Slovakia)
Ivan Hubeny, (co-chair, USA)	Simon Portegies Zwart (Netherlands)
Pavel Koubský (Czech Republic)	

### Local Organizing Committee

Anna Bobulova	Emil Kundra
Ján Budaj	Theodor Pribulla (co-chair)
Zuzana Cariková	Matej Sekeráš
Drahomír Chochol	Augustín Skopal
L'ubomír Hambálek	Martin Vaňko
Ladislav Hric (co-chair)	Juraj Zverko
Richard Komžík	

### Acknowledgements

The symposium was sponsored and supported by IAU Divisions III (Planetary Systems Sciences), IV (Stars), V (Variable Stars), and IX (Optical & Infrared Techniques); by IAU Commissions C25 (Stellar Photometry & Polarimetry), C27 (Variable Stars), C29 (Stellar Spectra), C36 (Theory of Stellar Atmospheres), C42 (Close Binary Stars), C53 (Extrasolar Planets), and C54 (Optical & Infrared Interferometry); and by the IAU Working Groups on Ap & Related Stars and Active B Stars.

Funding by the  
International Astronomical Union,  
Astronomical Institute, Slovak Academy of Sciences,  
American Astronomical Society International Travel Grant Fund,  
SÚH - Slovak Central Observatory, Hurbanovo,  
TESCO Poprad, Sintra Poprad, Papyrus Poprad,  
The Town of Vysoké Tatry, The Town of Poprad,  
The High Tatras Tourism Association,  
Nord Svit, and Buntavar Svit  
is gratefully acknowledged.



Conference photographs







Carlson Chambliss celebrates his 70th Birthday during the Welcome Party.



Participants in the conference hall.



Participants in the conference hall.



Participants in the conference hall.





Panelists (left to right): Robert Wilson, Alan Batten, Virginia Trimble, France Allard, Peter Eggleton, Albert Linnell, Wilhelm Kley, Artie Hatzes, Edwin Budding.  
Not shown: Edward Devinney, Helmut Lammer, and Ivan Hubeny.



Panelists: Robert Wilson, Alan Batten, and Virginia Trimble.



Rafting on the Dunajec River.



Rafting on the Dunajec River.





Exploring Spiš Castle.



Inside Hotel Stela in Levoča.



Observing performance of Slovak music and dancers at the Conference Reception.



Watching the performance during the Conference Reception.





Showing appreciation for the entertainment at the Conference Reception.



Performers leaving the Conference Reception.

## Participants

<b>Albrecht</b> , Simon	USA	<b>Guinan</b> , Edward	USA
<b>Alfonso-Garzon</b> , Julia	Spain	<b>Hadrava</b> , Petr	Czech Republic
<b>Allard</b> , France	France	<b>Hambleton</b> , Kelly	United Kingdom
<b>Allers</b> , Katelyn	USA	<b>Harmanec</b> , Petr	Czech Republic
<b>Baluev</b> , Roman	Russian Federation	<b>Hatzes</b> , Artie	Germany
<b>Barria</b> , Daniela	Chile	<b>Hegedus</b> , Tibor	Hungary
<b>Batten</b> , Alan	Canada	<b>Hillier</b> , D. John	USA
<b>Bergfors</b> , Carolina	Germany	<b>Hinkley</b> , Sasha	USA
<b>Bisikalo</b> , Dmitry	Russian Federation	<b>Hric</b> , Ladislav	Slovakia
<b>Bjorkman</b> , Jon	USA	<b>Hubeny</b> , Ivan	USA
<b>Bjorkman</b> , Karen	USA	<b>Hypki</b> , Arkadiusz	Poland
<b>Bochkarev</b> , Nikolai	Russian Federation	<b>Iliev</b> , Ilian	Bulgaria
<b>Bonanos</b> , Alceste	Greece	<b>Iliev</b> , Lubomir	Bulgaria
<b>Bonavita</b> , Mariangela	Canada	<b>Inlek</b> , Gulay	Turkey
<b>Bonifacio</b> , Piercarlo	France	<b>Ionov</b> , Dmitry	Russian Federation
<b>Budaj</b> , Jan	Slovakia	<b>Janik</b> , Jan	Czech Republic
<b>Budding</b> , Edwin	New Zealand	<b>Jurkic</b> , Tomislav	Croatia
<b>Burrows</b> , Adam	USA	<b>Jurkovic</b> , Monika	Serbia and Montenegro
<b>Carikova</b> , Zuzana	Slovakia	<b>Kovari</b> , Zsolt	Hungary
<b>Celik</b> , Lale	Turkey	<b>Kafka</b> , Stella	USA
<b>Chambliss</b> , Carlson	USA	<b>Kalomeni</b> , Belinda	Turkey
<b>Chochol</b> , Drahomir	Slovakia	<b>Kang</b> , Young-Woon	Korea
<b>Chrastina</b> , Marek	Czech Republic	<b>Karitskaya</b> , Eugenia	Russian Federation
<b>Christopoulou</b> , Eleftheria	Greece	<b>Kim</b> , Eun-Jeong	Korea
<b>Clarke</b> , Cathie	United Kingdom	<b>Kiss</b> , Laszlo	Hungary
<b>Cseki</b> , Attila	Serbia and Montenegro	<b>Kley</b> , Wilhelm	Germany
<b>Csizmadia</b> , Szilard	Germany	<b>Kolbas</b> , Vladimir	Croatia
<b>Daemgen</b> , Sebastian	Germany	<b>Konacki</b> , Maciej	Poland
<b>Danehkar</b> , Ashkbiz	Australia, Iran	<b>Konorski</b> , Piotr	Poland
<b>Day-Jones</b> , Avril	Chile	<b>Korcakova</b> , Daniela	Czech Republic
<b>De Marco</b> , Orsola	Australia	<b>Kotnik-Karuza</b> , Dubravka	Croatia
<b>Demidova</b> , Tatiana	Russian Federation	<b>Koubsky</b> , Pavel	Czech Republic
<b>Demircan</b> , Osman	Turkey	<b>Koumpia</b> , Evgenia	Greece
<b>Devinney, Jr.</b> , Edward	USA	<b>Kreiner</b> , Jerzy	Poland
<b>Djurasevic</b> , Gojko	Serbia and Montenegro	<b>Krejцова</b> , Tereza	Czech Republic
<b>Dobbs-Dixon</b> , Ian	USA	<b>Kundra</b> , Emil	Slovakia
<b>Drozd</b> , Marek	Poland	<b>Kurfurst</b> , Petr	Czech Republic
<b>Eggleton</b> , Peter	USA	<b>Kyurkchieva</b> , Diana	Bulgaria
<b>Eyer</b> , Laurent	Switzerland	<b>Lammer</b> , Helmut	Austria
<b>Freimanis</b> , Juris	Latvia	<b>Latkovic</b> , Olivera	Serbia and Montenegro
<b>Funk</b> , Barbara	Austria	<b>Lee</b> , Jeong Eun	Korea
<b>Galis</b> , Rudolf	Slovakia	<b>Lee</b> , Jae Woo	Korea
<b>Gazeas</b> , Kosmas	Netherlands	<b>Lee</b> , Chung-Uk	Korea
<b>Gomes</b> , Joana	United Kingdom	<b>Lehmann</b> , Holger	Germany
<b>Gonzalez Hernandez</b> , Jonay	Spain	<b>Liska</b> , Jiri	Czech Republic
<b>Groh</b> , Jose	Germany	<b>Liakos</b> , Alexios	Greece
<b>Grygar</b> , Jiri	Czech Republic	<b>Linnell</b> , Albert	USA
<b>Macenka</b> , Steven	USA	<b>Sarta Dekovic</b> , Mariza	Croatia
<b>Maceroni</b> , Carla	Italy	<b>Schmidt</b> , Tobias	Germany
<b>Marchev</b> , Dragomir	Bulgaria	<b>Schwarz</b> , Richard	Austria
<b>Markakis</b> , Konstantinos	Greece	<b>Sejnova</b> , Klara	Czech Republic
<b>Mayama</b> , Satoshi	Japan	<b>Sekeras</b> , Matej	Slovakia
<b>Mennickent</b> , Ronald	Chile	<b>Senavci</b> , Hakan	Turkey
<b>Miklos</b> , Peter	Slovakia	<b>Serabyn</b> , Eugene	USA
<b>Mikulasek</b> , Zdenek	Czech Republic	<b>Sipocz</b> , Brigitta	United Kingdom



<b>Milic, Ivan</b>	Serbia and Montenegro	<b>Skoda, Petr</b>	Czech Republic
<b>Mkrtichian, David</b>	Ukraine	<b>Skopal, Augustin</b>	Slovakia
<b>Mochnacki, Stefan</b>	Canada	<b>Stachowski, Greg</b>	Poland
<b>Montgomery, Michele</b>	USA	<b>Stateva, Ivanka</b>	Bulgaria
<b>Morais, Helena</b>	Portugal	<b>Stee, Philippe</b>	France
<b>Nedoroscik, Jozef</b>	Slovakia	<b>Stringfellow, Guy</b>	USA
<b>Neilson, Hilding</b>	Germany	<b>Southworth, John</b>	United Kingdom
<b>Nemravova, Jana</b>	Czech Republic	<b>Sudar, Davor</b>	Croatia
<b>Netopil, Martin</b>	Austria	<b>Szabo, Gyula</b>	Hungary
<b>Neustroev, Vitaly</b>	Finland	<b>Szalai, Tamas</b>	Hungary
<b>Niarchos, Panagiotis</b>	Greece	<b>Tout, Christopher</b>	United Kingdom
<b>Nikolov, Nikolay</b>	Germany	<b>Triaud, Amaury</b>	Switzerland
<b>Ogloza, Waldemar</b>	Poland	<b>Trimble, Virginia</b>	USA
<b>Olah, Katalin</b>	Hungary	<b>Tsvetkova, Tatiana</b>	Russian Federation
<b>Otulakowska, Magdalena</b>	Poland	<b>Vanko, Martin</b>	Slovakia
<b>Pasternacki, Thomas</b>	Germany	<b>Vidotto, Aline</b>	United Kingdom
<b>Paunzen, Ernst</b>	Austria	<b>Vince, Istvan</b>	Serbia and Montenegro
<b>Pavlovski, Kresimir</b>	Croatia	<b>von Essen, Carolina</b>	Germany
<b>Peters, Geraldine</b>	USA	<b>Votruba, Viktor</b>	Czech Republic
<b>Pilat-Lohinger, Elke</b>	Austria	<b>Whittaker, Gemma</b>	United Kingdom
<b>Pilecki, Bogumil</b>	Poland	<b>Wilson, Robert</b>	USA
<b>Pilello, Antonio</b>	Germany	<b>Wolf, Marek</b>	Czech Republic
<b>Plavalova, Eva</b>	Slovakia	<b>Yakobchuk, Taras</b>	Ukraine
<b>Popova, Elena</b>	Russian Federation	<b>Yakut, Kadri</b>	Turkey
<b>Pribulla, Theodor</b>	Slovakia	<b>Zakhozhay, Olga</b>	Ukraine
<b>Prsa, Andrej</b>	USA	<b>Zakrzewski, Bartlomiej</b>	Poland
<b>Queloz, Didier</b>	Switzerland	<b>Zasche, Petr</b>	Czech Republic
<b>Ratajczak, Milena</b>	Poland	<b>Zejda, Miloslav</b>	Czech Republic
<b>Reed, Phillip</b>	USA	<b>Zielinski, Pawel</b>	Poland
<b>Reckova, Valeria</b>	Slovakia	<b>Ziznovsky, Jozef</b>	Slovakia
<b>Richards, Mercedes</b>	USA	<b>Zola, Staszek</b>	Poland
<b>Rode-Paunzen, Monika</b>	Austria	<b>Zucker, Shay</b>	Israel
<b>Rucinski, Slavek</b>	Canada	<b>Zverko, Juraj</b>	Slovakia
<b>Ruzdjak, Domagoj</b>	Croatia		

## Address by the Scientific Organizing Committee

Vitajte! This means “Welcome” in Slovak. Thank you for your participation in this conference.

On behalf of the Scientific Organizing Committee for IAU Symposium 282, we thank the Prime Minister of Slovakia, Professor Dr. Iveta Radičová, for her support of this conference, and also Dr. Aleš Kucera, Director of the Astronomical Institute of the Slovak Academy of Sciences. We are grateful also for the support of the mayors of Vysoké Tatry and Poprad.

It is a delightful honor to be standing here today before such a distinguished group of scientists. We have come here to make a bridge between the astronomers who study multiple star systems and those who study systems containing multiple planets. Over 560 exoplanets have already been discovered and now we are on the cusp of discovering true Earth-like exoplanets. The tools we will discuss at this conference will help to make these discoveries a reality, hopefully within the next five years.

The scientific organizing committee has prepared an interesting program for us and we hope that many new collaborations will result from this exchange of ideas.

It is our pleasure to introduce our distinguished panelists who will lead us in some invigorating discussions about unsolved problems: France Allard, Alan Batten, Edwin Budding, Edward Devinney, Peter Eggleton, Artie Hatzes, Ivan Hubeny, Wilhelm Kley, Helmut Lammer, Albert Linnell, Virginia Trimble, and Robert E. Wilson.

The Local Organizing Committee and their families led by Dr. Theodor Pribulla and Dr. Ladislav Hric, have done a lot of work to get us to this moment. We are indebted to them for their contributions and the wonderful events they have planned for us.

Finally, this conference is dedicated to the modeling and analysis tools developed over the past 40 years and also to Dr. Antonín Bečvář, who provided us with his stellar atlases of the sky.

Dakujeme!

*Mercedes T. Richards and Ivan Hubeny, SOC co-chairs  
Tatranská Lomnica, 18 July 2011*