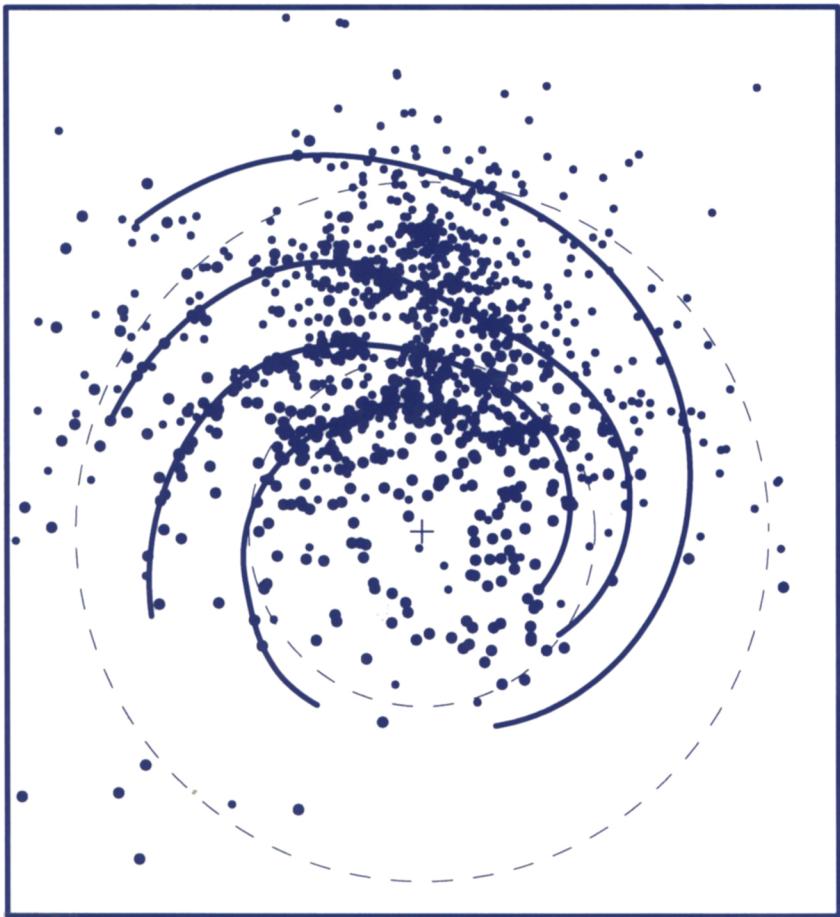




PULSAR ASTRONOMY - 2000 AND BEYOND
IAU Colloquium 177



Edited by
M. Kramer, N. Wex, and R. Wielebinski

PULSAR ASTRONOMY - 2000 AND BEYOND
IAU Colloquium 177

COVER ILLUSTRATION:

Pulsar population as known at the time of the conference, taken from the contribution of Camilo et al. The figure shows the pulsars projected onto the Galactic Plane, where the Galactic Center is marked by the cross. Circles of galactocentric radii 5 and 10 kpc, and the spiral arm structure as discussed in the Taylor & Cordes (1993) model are indicated.

**A SERIES OF BOOK ON RECENT DEVELOPMENT IN
ASTRONOMY AND ASTROPHYSICS**

First Published 2000
Copyright © 2000

ASTRONOMICAL SOCIETY OF THE PACIFIC
390 Ashton Avenue, San Francisco, California, USA 94112-1722
Phone: (415) 337-1100 **Fax: (415) 337-5205**
E-Mail: catalog@aspsky.org **Web Site: www.aspsky.org**

All Rights Reserved

No part of the material protected by this copyright notice may be reproduced or utilized in any form or by any means, electronic or mechanical including photocopying, recording or by any information storage and retrieval system, without written permission from the Astronomical Society of the Pacific.

ASP CONFERENCE SERIES - EDITORIAL STAFF

Managing Editor: D. H. McNamara
Associate Managing Editor: J. W. Moody
LaTeX-Computer Consultant: T. J. Mahoney
Production Manager: Enid L. Livingston

Editorial Office:
PO Box 24453, 211 KMB, Brigham Young University, Provo, Utah, 84602-4463
Phone: (801) 378-2111 Fax: (801) 378-4049 E-Mail: pasp@astrobyu.edu

ASP CONFERENCE SERIES PUBLICATION COMMITTEE:

Alexei V. Filippenko	Geoffrey Marcy
Ray Norris	Donald Terndrup
Frank X. Timmes	C. Megan Urry

Printed by:
Sheridan Books, Inc., 613 East Industrial Drive, Chelsea, Michigan 48118

Library of Congress Catalog Card Number: 00-102031
ISBN: 1-58381-029-3

ASTRONOMICAL SOCIETY OF THE PACIFIC
CONFERENCE SERIES



Volume 202

PULSAR ASTRONOMY - 2000 AND BEYOND
IAU Colloquium 177

Proceedings of a conference held at the
Max-Planck-Institut für Radioastronomie, Bonn, Germany
30 August - 3 September 1999

Edited by

M. Kramer

*University of Manchester, Jodrell Bank Observatory, Macclesfield
Cheshire, United Kingdom*

N. Wex

Max-Planck-Institut für Radioastronomie, Bonn, Germany

and

R. Wielebinski

Max-Planck-Institut für Radioastronomie, Bonn, Germany

A listing of all other ASP Conference Series Volumes and IAU Volumes
published by the ASP is cited at the back of this volume

Contents

Preface	xxi
Organizing Committees	xxiii
Conference participants	xxv
Conference photograph	xxxix

Part 1. Searching for Pulsars

The Parkes Multibeam Pulsar Survey	3
<i>F. Camilo, A. G. Lyne, R. N. Manchester, J. F. Bell, V. M. Kaspi, N. D'Amico, N. P. F. McKay, F. Crawford, I. H. Stairs, D. J. Morris, D. C. Sheppard and A. Possenti</i>	
The Parkes Multibeam Pulsar Survey Data Release	9
<i>J. F. Bell, R. N. Manchester, F. Crawford, A. G. Lyne, F. Camilo, V. M. Kaspi, I. H. Stairs, D. J. Morris, N. D'Amico, N. P. F. McKay, M. Kramer, D. C. Sheppard and A. Possenti</i>	
Pulsar Searches at Effelsberg — Past, Present and Future	11
<i>D. R. Lorimer and M. Kramer</i>	
New Pulsars from Arecibo Drift Scan Search	17
<i>A. Somer</i>	
Slow pulsars from the STScI/NAIC drift scan search	21
<i>K. M. Xilouris, A. Fruchter, D. R. Lorimer, J. Eder and A. Vazquez</i>	
Science with PuMa, the new Dutch PulsarMachine	23
<i>M. L. A. Kouwenhoven, B. W. Stappers, R. Ramachandran and J. L. L. Voûte</i>	
The Bologna submillisecond pulsar survey	27
<i>N. D'Amico</i>	
A Search for Sub-millisecond Pulsations in Unidentified FIRST and NVSS Radio Sources	31
<i>F. Crawford, V. M. Kaspi and J. F. Bell</i>	
Discovery of Eight Recycled Pulsars – The Swinburne Intermediate Latitude Pulsar Survey	33
<i>R. T. Edwards</i>	
The Steep Spectrum Pulsar Population	35
<i>D. L. Kaplan, J. M. Cordes and J. J. Condon</i>	

The Effelsberg Search for Pulsars in the Galactic Centre	37
<i>M. Kramer, B. Klein, D. Lorimer, P. Müller, A. Jessner and R. Wielebinski</i>	
A VLA Survey for Radio Pulsars in the Galactic Center	39
<i>T. J. W. Lazio and J. M. Cordes</i>	
Searching for FAST Pulsars	41
<i>M. McLaughlin, J. M. Cordes and Z. Arzoumanian</i>	
A Fast Search Technique for Binary Pulsars	43
<i>S. M. Ransom</i>	
Millisecond Pulsars and a WSRT Search for Candidates	45
<i>W. W. Tian, R. G. Strom, B. Stappers, X. Z. Zhang, X. J. Wu and R. Ramachandran</i>	

Part 2. Timing, General Relativity and Astrometry

Section A. Timing Observations

Timing the Parkes Multibeam Pulsars	49
<i>R. N. Manchester, A. G. Lyne, F. Camilo, V. M. Kaspi, I. H. Stairs, F. Crawford, D. J. Morris, J. F. Bell and N. D'Amico</i>	
High-Precision NBPP Timing Measurements at Nançay	55
<i>I. Cognard, J.-F. Lestrade, D. C. Backer, P. S. Ray, R. S. Foster and B. J. Cadwell</i>	
Pulsar timing at Kalyazin (Russia)	57
<i>O. V. Doroshenko, Yu. P. Ilyasov and V. V. Oreshko</i>	
Pulsar Timing at the Radiotelescope Effelsberg	61
<i>Ch. Lange, N. Wex, M. Kramer, O. Doroshenko and D. C. Backer</i>	
Pulsar timing measurements with the 32-m TCFA radiotelescope	63
<i>W. Lewandowski, M. Konacki, M. Redmerska, G. Feiler and A. Wolszczan</i>	
Pulsar Timing at Urumqi Astronomical Observatory	65
<i>N. Wang, X. Wu, J. Zhang, R. N. Manchester, A. Yusup and K. S. Cheng</i>	
Binary Eclipsing Millisecond Pulsars: A Decade of Timing	67
<i>D. J. Nice, Z. Arzoumanian and S. E. Thorsett</i>	
High Precision Timing of PSR J0437–4715	73
<i>M. C. Britton, W. van Straten, M. Bailes, M. Toscano and R. N. Manchester</i>	
Semi-analytical theory of motion for the PSR B1257+12 planetary system	77
<i>M. Konacki, A. J. Maciejewski and A. Wolszczan</i>	
Timing of the young pulsar J1907+0918	81
<i>K. Xilouris, D. R. Lorimer and A. Dowd</i>	
Phase locked Spectroscopic Imaging of the Crab Pulsar	83
<i>J. L. A. Fordham, J. R. Robinson, H. Kawakami, R. Michel and R. Much</i>	

High Time Resolution Observations of the Crab Pulsar with the UCL MIC Detector	85
<i>R. Much, A. Carramiñana, J. L. A. Fordham, H. Kawakami and R. Michel</i>	
Millisecond Pulsars in 47 Tucanae	87
<i>P. C. Freire, F. Camilo, D. R. Lorimer, A. G. Lyne and R. N. Manchester</i>	
The microlensing probability of the pulsars located in globular clusters	89
<i>T. Larchenkova</i>	

Section B. Timing Irregularities

Periodicities in Rotation and Pulse Shape in PSR B1828–11	93
<i>A. G. Lyne, I. H. Stairs and S. L. Shemar</i>	
Evidence for Free Precession in the Pulsar B1642–03	99
<i>T. V. Shabanova and J. O. Urama</i>	
Pulsar timing noise spectra of pulsars 0834+06, 1237+25, 1919+21, 2016+28 from 1978 – 1999 yrs. observations	101
<i>Yu. P. Ilyasov, V. A. Potapov and A. E. Rodin</i>	
The Noise Structure of Pulsar Clocks	103
<i>W. Kundt</i>	
Gravitational perturbations as a source of timing noise	105
<i>A. E. Rodin</i>	
Glitch Behavior of the Pulsar B1822–09 in the Range 0.1–2.3 GHz	107
<i>T. V. Shabanova and J. O. Urama</i>	
Glitches in Southern Pulsars	109
<i>N. Wang, R. N. Manchester, R. Pace, M. Bailes, V. M. Kaspi, B. W. Stappers and A. G. Lyne</i>	

Section C. General Relativity

Small-eccentricity binary pulsars and relativistic gravity	113
<i>N. Wex</i>	
Binary Pulsar Tests of General Relativity in the Presence of Low-Frequency Noise	117
<i>S. M. Kopeikin and V. A. Potapov</i>	
Geodetic Precession in PSR B1534+12	121
<i>I. H. Stairs, S. E. Thorsett, J. H. Taylor and Z. Arzoumanian</i>	
Geodetic Precession and the Binary Pulsar B1913+16	125
<i>A. Karastergiou, M. Kramer, N. Wex and A. von Hoensbroech</i>	
General Relativistic Precession of the Spin Axis of Binary Pulsar B1913+16: First Two Dimensional Maps of the Emission Beam	127
<i>J. M. Weisberg and J. H. Taylor</i>	

Numerical solution of the spin angular momenta of millisecond pulsar PSR J0751+1807	131
<i>B. P. Gong and K. S. Cheng</i>	

Section D. Astrometry

Pulsar Position, Proper Motion, and Parallax via VLBI	135
<i>R. M. Campbell</i>	
VLBI Neutron Star Astrometry: Techniques and Initial Results	139
<i>S. Chatterjee and J. M. Cordes</i>	
Astrometry of Southern Pulsars	141
<i>D. Legge</i>	
The Proper Motions of Young Pulsars	143
<i>N. P. F. McKay, B. Anderson, A. G. Lyne and J. L. Horlock</i>	
Timing noise as a source of discrepancy between timing and VLBI pulsar positions	145
<i>A. E. Rodin, Yu. P. Ilyasov, V. V. Oreshko and M. Sekido</i>	

Part 3. Studies of Radio Emission

Section A. Single Pulses

Characteristics of Pulsar Radio Emission at Single-pulse Resolution	149
<i>A. A. Deshpande</i>	
Polar-Fluxtube Emission ‘Weather’ of Pulsar B0943+10: Polarisation, Modes, and Theoretical Implications	155
<i>J. M. Rankin and A. A. Deshpande</i>	
Pulse Fluctuation Properties at 35 MHz	161
<i>A. Asgekar and A. A. Deshpande</i>	
Detection of new emission components in PSR B0329+54	163
<i>R. T. Gangadhara, Y. Gupta and D. R. Lorimer</i>	
Giant Pulses from the Crab Pulsar	165
<i>T. H. Hankins</i>	
Pulse Properties of a few Southern Pulsars at 150 MHz	171
<i>N. H. Issur and A. A. Deshpande</i>	
Constraints on Emission Mechanism from the Nulling and Drifting Pulsar PSR B0031–07	173
<i>B. C. Joshi and M. Vivekanand</i>	
Single Pulse Analysis of the Core-Dominated Pulsar B0611+22	175
<i>J. S. Kern</i>	

Identification of Physical Components in Pulsar Emission	177
<i>J. H. Seiradakis, A. Karastergiou, M. Kramer and D. Psaltis</i>	
Parameters of microstructure and noiselike intensity fluctuation in pulsar radio emission measured with submicrosecond time resolution provided by the S2 VLBI recording/playback system	179
<i>M. V. Popov, V. I. Kondrat'ev, V. I. Altunin, N. Bartel, W. Cannon and A. Yu. Novikov</i>	
Microstructure and other short time-scale events in millisecond pulsars	181
<i>V. A. Soglasnov</i>	
Section B. Averaged Pulses	
Ha, ha, ha, ha, staying alive, staying alive: A radio pulsar with an 8.5-s period challenges emission models	185
<i>M. D. Young, R. N. Manchester and S. Johnston</i>	
Pulsar Profiles and Structure of the Emission Region	189
<i>A. Kuzmin</i>	
Pulsar radio emission beams	195
<i>J. Kijak</i>	
Hollow Core?	197
<i>G. J. Qiao, J. F. Liu, Y. Wang, X. J. Wu and J. L. Han</i>	
The Geometry Asymmetry of Mean Pulse Profile of Pulsar	199
<i>X. J. Wu, J. Pan and X. B. Xu</i>	
A Decade of Low Frequency Pulsar Polarimetry at PRAO: a Review of the Main Results	201
<i>S. A. Suleymanova and V. D. Pugachev</i>	
Pulsar Studies at High Radio Frequencies	205
<i>R. Wielebinski</i>	
Measuring the Size of the Vela Pulsar's Radio Emission Region	211
<i>C. R. Gwinn, J. E. Reynolds, D. L. Jauncey, H. Hirabayashi, H. Kobayashi, Y. Murata, P. G. Edwards, B. Carlson, S. Dougherty, D. Del Rizzo, M. C. Britton, P. M. McCulloch and J. E. J. Lovell</i>	
Nanoarcsecond Single-Dish Imaging of the Vela Pulsar	215
<i>J.-P. Macquart, S. Johnston, M. Walker and D. Stinebring</i>	
Finding Pulsar Emission Heights from Dual-Frequency Observations	219
<i>L. A. Nowakowski</i>	
Pulsar radio spectra and the interstellar scintillation	221
<i>V. M. Malofeev</i>	
Pulsar spectra analysis	227
<i>O. Maron, J. Kijak, M. Kramer and R. Wielebinski</i>	
Radio Emission Properties of Millisecond Pulsars	229
<i>M. Kramer and K. M. Xilouris</i>	

Observations of millisecond pulsars at 102 MHz	235
<i>A. Kuzmin and B. Losovsky</i>	
Difference and similarity in physics of millisecond and normal pulsars	237
<i>V. A. Soglasnov</i>	
A VLA Search for the Geminga Pulsar at 74 and 326 MHz	239
<i>N. E. Kassim and T. J. W. Lazio</i>	
Mean, individual pulses and spectrum of Geminga radio emission	241
<i>V. M. Malofeev and O. I. Malov</i>	
Section C. Polarization	
Linear Polarization Properties of Pulsars at 35 and 327 MHz	245
<i>A. Asgekar and A. A. Deshpande</i>	
Radio Polarimetry Results for Young Southern Pulsars	247
<i>F. Crawford, V. M. Kaspi and R. N. Manchester</i>	
Orthogonal Polarization Modes and Emission Regions of PSR B1133+16	249
<i>Y. Gupta, R. T. Gangadhara and N. Rathnashree</i>	
Polarization Characteristics of Pulsar Profiles	251
<i>J. L. Han, R. N. Manchester and G. J. Qiao</i>	
Signatures of Polar-cap Current Flow in Polarization Angle Sweeps	253
<i>J. A. Hirschman and J. Arons</i>	
Single Pulse Polarimetry of the Vela Pulsar	257
<i>J. S. Kern, T. H. Hankins and J. M. Rankin</i>	
The Mode-Separated Pulse Profiles of Pulsar Radio Emission	261
<i>M. M. McKinnon and D. R. Stinebring</i>	
Evolution of Multipolar Magnetic Fields in Isolated Neutron Stars and its effect on Pulsar Radio Emission	265
<i>D. Mitra, S. Konar, D. Bhattacharya, A. von Hoensbroeck, J. H. Seiradakis and R. Wielebinski</i>	
Pulsar Polarimetry - New Aspects at High Radio Frequencies	267
<i>A. von Hoensbroeck</i>	
A Search for Variable Interstellar Magnetic Fields and Neutron Star Precession in Four Years of Polarization Position Angle Measurements on 98 Pulsars	269
<i>J. M. Weisberg, J. J. Morgan, J. T. Despotes, J. E. Everett and J. M. Cordes</i>	
Section D. Instrumentation	
Analysis of PSR 1641-45 Using Specialized Capabilities of the S2 VLBI Correlator	273
<i>D. A. Del Rizzo, B. R. Carlson and W. T. Petrachenko</i>	

WAPP — Wideband Arecibo Pulsar Processor	275
<i>A. Dowd, W. Sisk and J. Hagen</i>	
Pulsar Research with the GMRT: A Status Report	277
<i>Y. Gupta, P. Gothiskar, B. C. Joshi, M. Vivekanand, R. Swain, S. Sirothia and N. D. R. Bhat</i>	
PuMa, the new Dutch PulsarMachine	279
<i>M. L. A. Kouwenhoven, P. C. van Haren, D. Driesens, J. J. Langerak, T. D. Beijaard, J. L. L. Voûte, B. W. Stappers and R. Ramachandran</i>	
Coherent De-dispersion Observations at Jodrell Bank	281
<i>S. M. Ord, I. H. Stairs and F. Camilo</i>	
Pulsar Applications of the Caltech Parkes Swinburne Baseband Processing System	283
<i>W. van Straten, M. Britton, M. Bailes, S. Anderson and S. Kulkarni</i>	
An Arithmetic Method for Mean Pulse Profile De-disperse of pulsars	285
<i>X. J. Wu and X. F. Liu</i>	

Part 4. Optical Observations

A Sociological Study of the Optically Emitting Isolated Neutron Stars	289
<i>P. A. Caraveo</i>	
CLYPOS: the Cananea-Ljubljana Young Pulsar Optical Survey	295
<i>A. Carramiñana, A. Čadež and C. Alvarez</i>	
Unpulsed Optical Emission from the Crab Pulsar	297
<i>A. Golden, A. Shearer and G. Beskin</i>	
PSR B0656+14: Combined Optical, X-ray and EUV Studies	299
<i>A. Golden, A. Shearer and J. Edelstein</i>	
Search for an Optical Counterpart of PSR J0537–6910	301
<i>C. Gouiffès and H. Ögelman</i>	
NTT and VLT Observations of two young pulsars	303
<i>R. Mignani</i>	
Pulsar optical observation with the Very Large Telescope	305
<i>A. Ray, P. Lundqvist, J. Sollerman, B. Leibundgut and F. Sutaria</i>	
Implications of the Optical Observations of Isolated Neutron Stars	307
<i>A. Shearer, A. Golden and G. Beskin</i>	
OPTIMA An Optical Pulsar Timing Analyser	311
<i>C. Straubmeier and G. Kanbach</i>	
Limits on the optical magnitude of PSR 1821–24 in M28	313
<i>F. K. Sutaria</i>	

Optical Polarization Measurements of Pulsars	315
<i>S. J. Wagner and W. Seifert</i>	

Part 5. High-Energy Observations

X-ray emission characteristics of pulsars and their nebulae	321
<i>W. Becker</i>	
ASCA and RXTE Upper Limits to Pulsed Emissions from PSR B1951+32	327
<i>H.-K. Chang and T.-F. Guo</i>	
Timing and spectral Properties of PSR B1509–58 observed with BeppoSAX	329
<i>G. Cusumano, T. Mineo, L. Nicastro, E. Massaro, S. Massaglia, E. Trussoni and W. Becker</i>	
RXTE Observations of the Vela Pulsar: The X-ray-Optical Connection	331
<i>A. K. Harding, M. S. Strickman, C. Gwinn, P. McCulloch and D. Moffet</i>	
Intensive X-ray Monitoring of the 16ms Crab-like Pulsar PSR J0537–6910	335
<i>F. E. Marshall, E. V. Gotthelf, J. Middlelitch, Q. D. Wang and W. Zhang</i>	
Fine Phase Resolved X-ray Spectroscopy of the Crab Pulsar with BeppoSAX	341
<i>E. Massaro, M. Litterio, G. Cusumano and T. Mineo</i>	
ASCA Observations of the Crab-Like Pulsar PSR B0540–69	343
<i>F. Nagase, T. Endo, M. Hirayama, N. Kawai and M. Itoh</i>	
PSR J0218+4232 in the energy band 1–10 keV observed with BeppoSAX	347
<i>L. Nicastro</i>	
X-ray observations of the high magnetic field radio pulsar PSR J1814–1744	349
<i>M. J. Pivovaroff, V. M. Kaspi and F. Camilo</i>	
ASCA observations of Galactic rotation-powered pulsars	351
<i>M. J. Pivovaroff, V. M. Kaspi and E. V. Gotthelf</i>	
Detection of Pulsed X-ray Emission from The Fastest Millisecond Pulsar PSR B1937+21 with ASCA	353
<i>M. Takahashi, S. Shibata, K. Torii, Y. Saito, N. Kawai, M. Hirayama, T. Dotani, S. Gunji and H. Sakurai</i>	
Likely detection of pulsed high-energy γ -rays from millisecond pulsar PSR J0218+4232	355
<i>L. Kuiper, W. Hermsen, F. Verbunt, A. Lyne, I. Stairs, D. J. Thompson and G. Cusumano</i>	
Gamma Ray Pulsar Luminosities	359
<i>M. McLaughlin and J. Cordes</i>	

Part 6. Emission and Plasma Theory

Section A. Radio Emission and Pulsar Electrodynamics

The Superluminal Model of Pulsars	365
<i>H. Ardavan</i>	
Testing the two-stream instability in a pulsar magnetosphere	367
<i>E. Asseo</i>	
Energy Loss of Radio Pulsars	371
<i>V. S. Beskin and R. R. Rafikov</i>	
The Statistics of Radio Pulsars: A Spark Model	375
<i>K. S. Cheng and G. L. Fan</i>	
Non-Dipolar Magnetic Fields in Pulsars	377
<i>J. A. Eilek and T. H. Hankins</i>	
Applications of Ohm's Law to the pulsar magnetosphere	379
<i>T. Kunzl, H. Lesch and A. Jessner</i>	
A low energy-model for coherent radio emission — the three-liter-pulsar	381
<i>H. Lesch, T. Kunzl and A. Jessner</i>	
Generation of pulsar radio emission	387
<i>Yu. E. Lyubarskii</i>	
Coherent Mechanisms of Pulsar Radio Emission	389
<i>M. Lyutikov, R. Blandford and G. Machabeli</i>	
Scattering and Diffraction in Magnetospheres of Fast Pulsars	393
<i>M. Lyutikov and A. Parikh</i>	
A possible mechanism for flattening of pulsar spectra at high frequencies	395
<i>I. F. Malov</i>	
A Model for the Pulsar Radio Emission	397
<i>G. Melikidze, J. Gil and A. Pataraya</i>	
Formation of beam-plasma structures in pulsar magnetosphere	401
<i>V. N. Mel'nik</i>	
Propagation of radio waves in pulsar magnetospheres	403
<i>S. A. Petrova and Yu. E. Lyubarskii</i>	
Recent developments of inverse Compton scattering model of pulsar radio emission	405
<i>G. J. Qiao, R. X. Xu, J. F. Liu, B. Zhang and J. L. Han</i>	
Beams in Magnetised Pair Plasmas	409
<i>E. T. Rowe</i>	
Pulsar Electrodynamics	411
<i>S. Shibata</i>	

Radiating Regions in Pulsar Magnetospheres: From Theory to Observations and Back	417
<i>V. V. Usov</i>	
On the nature of optical emission from radio pulsars	421
<i>I. F. Malov and G. Z. Machabeli</i>	
On the Nature of the Geminga Pulsar	423
<i>D. Khechinashvili, G. Melikidze and J. Gil</i>	
Section B. High-Energy Emission	
High Energy Radiation from Pulsars	427
<i>K. S. Cheng</i>	
Model of pulse separation in the gamma light curve of the Vela pulsar .	433
<i>J. Dyks and B. Rudak</i>	
Beaming Due to Comptonisation in X-ray Pulsars	435
<i>D. K. Galloway and K. Wu</i>	
A Ray-Tracing Model of the Vela Magnetosphere	437
<i>C. Hirano and C. R. Gwinn</i>	
A model for the energetic emission from pulsars	439
<i>Yu. E. Lyubarskii</i>	
Thermal X-Ray Pulses Resulting From Pulsar Glitches	441
<i>A. P. S. Tang and K. S. Cheng</i>	
Section C. Pair-Plasma Processes	
The Pair Cascade in Strong and Weak Field Pulsars	445
<i>P. N. Arendt, Jr. and J. A. Eilek</i>	
Pulsar Death at an Advanced Age	449
<i>J. Arons</i>	
The Pulsar Pair Plasma	455
<i>E. Asseo and A. Riazuelo</i>	
Pulsar Magnetospheres: Classical, Quasi-Classical and Quantum Descriptions	457
<i>A. A. da Costa</i>	
Possible re-acceleration regions above the inner gap and pulsar gamma-ray emission	461
<i>B. H. Hong, G. J. Qiao, B. Zhang, J. L. Han and R. X. Xu</i>	
Charge Densities above Pulsar Polar Caps	463
<i>A. Jessner, H. Lesch and Th. Kunzl</i>	
Some Peculiarities of the Relativistic Electron-Positron Plasma Dynamics in the Pulsar Magnetosphere	465
<i>I. S. Nanobashvili</i>	

ICS as a Limiting Factor for Electron Energies in Pulsar Magnetospheres <i>R. Supper</i>	469
Emission of particles and photons in the pulsar polar cap <i>A. I. Tygynan</i>	473
High-energy accelerators above pulsar polar caps <i>R. X. Xu, G. J. Qiao and B. Zhang</i>	479
A full polar cap cascade model: pulsar γ -ray and X-ray luminosities . . <i>B. Zhang and A. K. Harding</i>	481

Part 7. The Surrounding of Pulsars

Neutron Star/Supernova Remnant Associations <i>V. M. Kaspi</i>	485
Puzzling Pulsars and Supernova Remnants <i>D. R. Lorimer and R. Ramachandran</i>	491
1997 October Event(s) in the Crab Pulsar <i>D. C. Backer</i>	493
The Crab pulsar echoes <i>F. Graham Smith and A. G. Lyne</i>	499
Infrared Observations of the Crab Nebula <i>Y. A. Gallant and R. J. Tuffs</i>	503
Plasma Theory of Two Synchrotron Knots' formation Discovered in the Crab Nebula <i>D. Shapakidze and G. Machabeli</i>	505
Time-variability of the Crab Nebula wisps <i>A. Spitkovsky and J. Arons</i>	507
Supernova Remnant CTB 80 and PSR 1951+32 <i>R. G. Strom and B. W. Stappers</i>	509
The interaction of pulsar winds with old supernova remnants <i>E. van der Swaluw, A. Achterberg and Y. A. Gallant</i>	513
A VLBI Search for a Pulsar Nebula in SN1993J in the Galaxy M81 . . . <i>N. Bartel, M. F. Bietenholz, W. H. Cannon, M. P. Rupen, A. J. Beasley, D. A. Graham, V. I. Altunin, T. Venturi, G. Umana and J. E. Conway</i>	515
Bow Shocks from Radio Pulsars: Observations of the Guitar Nebula . . <i>S. Chatterjee and J. M. Cordes</i>	517
Physical Connections Between Pulsar Outer Magnetospheres and Pulsar Nebulae <i>T. Chiueh</i>	519

The Remarkable Binary Pulsar PSR B1259–63	521
<i>S. Johnston</i>	
Probing pulsar winds using inverse Compton scattering	527
<i>L. Ball and J. G. Kirk</i>	
Transient radio emission from PSR B1259–63	529
<i>L. Ball, A. Melatos, S. Johnston and O. Skjæraasen</i>	
Predictions of inverse Compton radiation from PSR B1259–63	531
<i>J. G. Kirk, L. Ball and O. Skjæraasen</i>	
On the Nature of Radio Eclipsing	533
<i>Ya. N. Istomin</i>	
A Model for the Binary Pulsar Radio Eclipse	535
<i>D. Khechinashvili, G. Melikidze and J. Gil</i>	

Part 8. Pulsars and the Interstellar Medium

Pulsars and Interstellar Scintillations	539
<i>Y. Gupta</i>	
Pulsar Scintillation Studies and Structure of the Local Interstellar Medium	545
<i>N. D. R. Bhat, Y. Gupta, A. P. Rao and P. B. Preethi</i>	
Pulsar Scintillation Measurements: Is there any evidence for a Local Bubble Shell or effects from pulsar bow shocks?	549
<i>A. Minter</i>	
Constraints on Interstellar Plasma Turbulence Spectrum from Pulsar Observations at the Ooty Radio Telescope	553
<i>N. D. R. Bhat, Y. Gupta and A. P. Rao</i>	
Observations of the interstellar scintillation of nearby pulsars at 1.7 GHz with the 32-m Toruń radiotelescope	555
<i>M. Redmerska, M. Konacki, W. Lewandowski and A. Wolszczan</i>	
Pulsar distance measurements using interstellar scintillation data	557
<i>T. V. Smirnova and V. I. Shishov</i>	
A (new) Phenomenon in Pulsar Dynamic Spectra	559
<i>D. R. Stinebring, K. M. Becker, J. E. E. Goodman, M. A. Kramer, J. L. Sheppard, J. M. Cordes and T. J. Lazio</i>	
Extreme scattering of pulsars	561
<i>M. A. Walker</i>	
Search for Single Scattering Events	565
<i>R. Ramachandran, A. A. Deshpande and B. W. Stappers</i>	
Interstellar scintillation of the radio source associated with the gamma ray burst of 8 May 1997	569
<i>T. V. Smirnova and V. I. Shishov</i>	

Part 9. Population and Neutron Star Properties

Section A. Population, Spin-Down and Magnetic Field

Neutron Star Populations at the Millenium	573
<i>J. Cordes</i>	
Close Binaries with Two Compact Objects	579
<i>V. Kalogera</i>	
Recycling NSs to ultrashort periods: a statistical analysis of their evolution in the $\mu - P$ plane	585
<i>A. Possenti, M. Colpi, U. Geppert, L. Burderi and N. D'Amico</i>	
Theoretical Implications of the 47 Tuc Pulsars	589
<i>F. A. Rasio</i>	
New Direct Observational Evidence for Kicks in SNe	595
<i>T. M. Tauris and E. P. J. van den Heuvel</i>	
How well are Neutron Stars understood?	597
<i>W. Kundt</i>	
Braking Indices for Twenty Pulsars	599
<i>S. Johnston and D. Galloway</i>	
On the Existence of an Universal Spin-down Equation for Pulsars	601
<i>C. Alvarez and A. Carramiñana</i>	
Deconfinement signals from pulsar timing	603
<i>H. Grigorian, G. Poghosyan, E. Chubarian and D. Blaschke</i>	
On the origin and parameters of the pulsar-like white dwarf in AE Aquarii	605
<i>N. R. Ikhsanov</i>	
Magnetic field of pulsars with superconducting quark core	607
<i>D. Blaschke, D. M. Sedrakian and K. M. Shahabasyan</i>	
About the Magnetic Field Generation in Crab Nebula	609
<i>I. S. Nanobashvili</i>	

Section B. Thermal Evolution of Pulsars and Their Companion

Neutron Star Atmospheres	613
<i>G. G. Pavlov and V. E. Zavlin</i>	
Partially ionized layers of accreted envelopes of weakly and strongly mag- netized neutron stars	619
<i>A. Potekhin, G. Chabrier and Y. Shibanov</i>	
Heat and charge transport in envelopes of weakly and strongly magnetized neutron stars	621
<i>A. Potekhin</i>	

Non-LTE effects in neutron star atmospheres	623
<i>K. Werner and J. Deetjen</i>	
Polarization of Thermal Radiation from Neutron Stars	625
<i>V. E. Zavlin and G. G. Pavlov</i>	
HST Observations of PSR J2051–0827: Asymmetry, Variability and Modelling	627
<i>B. W. Stappers, M. van Kerkwijk and J. F. Bell</i>	
Low-Mass HeWDs and Millisecond Pulsars Age Determination	631
<i>J. Antipova, E. Ergma and M. J. Sarna</i>	
The Temperature and Cooling Age of the White-Dwarf Companion to the Millisecond Pulsar PSR B1855+09	633
<i>J. Bell, M. van Kerkwijk, V. Kaspi, and S. Kulkarni</i>	
The evolution of helium white dwarfs: Applications for millisecond pulsars	635
<i>T. Driebe, T. Blöcker and D. Schönberner</i>	
Helium white dwarf cooling in PSR J0751+1807 and PSR J1012+5307 .	637
<i>E. Ergma, J. Antipova and M. J. Sarna</i>	

Section C. Accreting Systems

Recycling in progress: RXTE discovery of the first accretion-powered millisecond pulsar	643
<i>M. van der Klis</i>	
Kilohertz QPOs and general-relativistic orbital motion—a maximum likelihood test	649
<i>T. Bulik</i>	
Evolution of the Magnetic Field of a Neutron Star During Polar-Cap Accretion	651
<i>A. Melatos and E. S. Phinney</i>	
Effect of Photon Rocket in X-ray Binaries	653
<i>V. D. Pal'shin and A. I. Tsygan</i>	

Section D. Interior of Neutron Stars

A microscopic study of neutron stars' structure	657
<i>I. Bombaci, M. Baldo and G. F. Burgio</i>	
Are there Strange Stars in the Universe?	659
<i>I. Bombaci</i>	
Rapidly rotating strange stars	661
<i>D. Gondek-Rosińska, P. Haensel, J. L. Zdunik and E. Gourgoulhon</i>	
Protoneutron stars and neutron stars	663
<i>D. Gondek-Rosińska, P. Haensel P. and J. L. Zdunik</i>	

Are Pulsars Bare Strange Stars?	665
<i>R. X. Xu, G. J. Qiao and B. Zhang</i>	

Part 10. Anomalous X-Ray Pulsars and Magnetars

Magnetars	669
<i>C. Thompson</i>	
Magneto rotational and Thermal Evolution of Magnetars with Crustal Magnetic Fields	681
<i>U. Geppert, D. Page, M. Colpi and T. Zannias</i>	
Low Frequency Radio Emission of Pulsar PSR J1907+0919 Associated with the Magnetar SGR 1900+14	685
<i>Yu. P. Shitov, V. D. Pugachev and S. M. Kutuzov</i>	
Bumpy Spin-Down of Anomalous X-Ray Pulsars: The Link with Magnetars	691
<i>A. Melatos</i>	
New ASCA Observations of two Anomalous X-ray Pulsars	695
<i>B. Paul, M. Kawasaki, T. Dotani and F. Nagase</i>	
A New View on Young Pulsars in Supernova Remnants: Slow, Radio-quiet and X-ray Bright	699
<i>E. V. Gotthelf and G. Vasisht</i>	
Anomalous X-ray pulsars and soft gamma-ray repeaters in supernova remnants	703
<i>B. M. Gaensler</i>	
Discovery of a supernova remnant with a central X-ray source: AX J184453.3–025642 in G 29.6+0.1	707
<i>E. V. Gotthelf, G. Vasisht, B. Gaensler and K. Torii</i>	

Part 11. The Future – Where to go ?

Studying pulsars with the SKA and other new facilities	711
<i>J. Bell</i>	
The Future X-ray Observations of Pulsars and Isolated Neutron Stars	717
<i>J. Trümper</i>	
The Status of Pulsar Emission Theory	721
<i>D. B. Melrose</i>	
Gravitational Waves and Neutron Stars	727
<i>B. F. Schutz</i>	

Detecting Gravitational Waves from Quasi-Continuous Sources: the German-British Project GEO 600	733
<i>A. Rüdiger</i>	

Part 12. Summary

IAU 177 — A week in review	737
<i>D. R. Lorimer</i>	
Author index	745
Subject index	749