

TABLE OF CONTENTS

| | |
|--|-----------|
| List of Participants | xix |
| Foreword | xxxvii |
| Introductory Review: Planetary Nebulae – L.H. ALLER | 1 |
| | |
| I. THE OBSERVATIONAL PN DATABASE | 9 |
| | |
| Classification Criteria and Databases – B. STENHOLM | 11 |
| Observational Parameters: Definitions and Limits – J.H. LUTZ | 19 |
| Results from Space – S.R. HEAP | 23 |
| | |
| Strasbourg-ESO Catalogue of Galactic Planetary Nebulae – A. ACKER, F. OCHSENBEIN | 33 |
| Four New Evolved Planetary Nebulae – S. TAMURA, R. WEINBERGER .. | 34 |
| New Planetary Nebulae – J. MARCOUT | 35 |
| New and Misclassified Planetary Nebulae – L. KOHOUTEK | 36 |
| Three Possible Planetary Nebulae from Near-IR Observations – P. PERSI, A. MARENZI, A. PREITE-MARTINEZ, M. FERRARI-TONILO ... | 37 |
| Planetary and Proto-Planetary Nebulae which are Strong 25 μ m Emitters – R.D. WOLSTENCROFT, M.A. READ, S.M. SCARROTT, C.J. LONSDALE, Q.A. PARKER | 38 |
| The Southern Deep Near Infrared Survey (DENIS). A Prospect of PN Exploration – S. KIMESWENGER, C. KIENEL | 39 |
| Radio Continuum Observations of Southern Planetary Nebulae Candidates – G.C. VAN DE STEENE, S.R. POTTASCH | 40 |
| The Photographic Observations of Some Planetary Nebulae – X. HAO | 41 |
| CCD Spectrophotometry of Planetary Nebulae at Wendelstein Observatory – M.M. ROTH, R.P. KUDRITZKI, R.H. MÉNDEZ | 42 |
| Planetary Nebulae as a Research Field – W. SAURER, R. WEINBERGER .. | 43 |
| A Clustering Method Applied to the Analysis of Planetary Nebulae – O.S. YATSYK | 44 |
| | |
| II. HIGHLIGHTS ON THE NUCLEI | 45 |
| | |
| Model Atmospheres of Central Stars of PN – R.P. KUDRITZKI, R.H. MÉNDEZ | 47 |
| Observed Mass Loss from Central Stars of Planetary Nebulae – M. PERINOTTO | 57 |
| Temperatures of Central Stars of Planetary Nebulae – A. PREITE-MARTINEZ | 65 |
| Atomic Data – a Bibliography – K. BUTLER | 73 |
| Luminosities of Central Stars of PN in the Galactic Bulge – R.H. MÉNDEZ .. | 81 |
| Unified Model Atmosphere Studies of Central Stars of Planetary Nebulae – R. GABLER, A. GABLER, R.H. MÉNDEZ, R.P. KUDRITZKI | 82 |

| | |
|---|-----|
| Metal Line Blanketed Non-LTE Model Atmospheres for Central Stars of Planetary Nebulae – K. WERNER, S. DREIZLER | 83 |
| Non-LTE Spectra of Iron Group Elements for CSPN – S.R. BECKER, K. BUTLER | 84 |
| The Properties of Planetary Nebulae Nuclei: Stellar Winds – L. BIANCHI, G. DE FRANCESCO | 85 |
| Spectroscopic Properties of the Nucleus of NGC 6826 – B. ALTNER, S.R. HEAP, I. HUBENY | 86 |
| Spectral Analyses of WC-Type Central Stars – W.R. HAMANN, L. KOESTERKE | 87 |
| Central Stars of Old Planetary Nebulae – R. NAPIWOTZKI | 88 |
| Infrared Emission-Lines and the Stellar Temperature – S.M. VIEGAS, R. GRUENWALD | 89 |
| Ultraviolet and Optical Spectra of Central Stars of Halo Planetary Nebulae – M. PEÑA, S. TORRES-PEIMBERT, M.T. RUIZ | 90 |
| A High Resolution Far-UV Spectral Atlas of CSPNs and Hot White Dwarfs – R.W. TWEEZY | 91 |
| The Wind Temperature and C/He and O/He Ratios of the WC10 Central Star CPD-56°8032 – M.J. BARLOW, P.J. STOREY | 92 |
| Mass Loss in Two Low Temperature Central Stars of Planetary Nebulae – A. MODIGLIANI, M. PERINOTTO, P. PATRIARCHI | 93 |
| Stark Broadening Parameters of C IV Lines for Stellar Plasma Research – M.S. DIMITRIJEVIC, S. SAHAL-BRECHOT | 94 |
| E2 and M1 Transition Probabilities in Ions of the Nitrogen Isoelectronic Sequence Calculated Using MBPT – G. GAIGALAS, R. KISIELIUS, G. MERKELIS, M. VILKAS | 95 |
| MBPT Results for $\Delta n=0$ Electric Dipole Transitions – G. GAIGALAS, R. KISIELIUS, G. MERKELIS, Z. RUDZIKAS, M. VILKAS | 96 |
| III. HIGHLIGHTS ON THE NEBULAE | 97 |
| Energy Distribution of Planetary Nebulae (UV to Radio) – | |
| C.Y. ZHANG | 99 |
| Distances of Planetary Nebulae – Y. TERZIAN | 109 |
| Advances in Numerical Simulations of Gaseous Nebulae – | |
| G.F. FERLAND | 123 |
| Evolution of PN Morphologies: Concepts, Models and Observations – | |
| B. BALICK | 131 |
| Ring Nebulae around PN Nuclei and Massive Stars – | |
| Y.-H. CHU | 139 |
| The Neutral Envelopes of Planetary Nebulae: Molecules and H I – | |
| P.J. HUGGINS | 147 |
| Photodissociation Regions and Planetary Nebulae – | |
| A.G.G.M. TIELENS | 155 |
| Dust in Planetary Nebulae and in Post-AGB Objects – | |
| M.J. BARLOW | 163 |

| | |
|---|-----|
| On the Distances to Galactic Planetary Nebulae – C.Y. ZHANG | 173 |
| A Comparison of Nebular Distance Scales – M. SAMLAND, J. KÖPPEN, A. ACKER, B. STENHOLM | 174 |
| Trigonometric Parallaxes of Planetary Nebulae – J.R. PIER, H.C. HARRIS, C.C. DAHN, D.G. MONET | 175 |
| Infrared Excess (IRE) as an Indicator of PN Distance – G. JACOBY | 176 |
| Interstellar Extinction of Planetary Nebulae – G. STASINSKA, R. TYLENDA, A. ACKER, B. STENHOLM | 177 |
| Interstellar Reddening Towards S188, HW4 and We1-6 – W. SAURER ... | 178 |
| The Shklovsky Paradox – D. BUCKLEY, S.E. SCHNEIDER, D. VAN BLERKOM | 179 |
| Reddening Distances for Planetary Nebulae from Broad Band BVIc CCD Imaging – D.L. POLLACCO, G. RAMSAY | 180 |
| The Ionization Structure of Planetary Nebulae – T. BARKER | 181 |
| CCD Photometry of NGC 2453 – D.C.V. MALLIK, R. SAGER, A.K. PATI | 182 |
| Electron Density and Nitrogen Abundances from FIR Lines – R.H. RUBIN, S.W.J. COLGAN, E.F. ERICKSON, M.R. HAAS, S.D. LORD, J.P. SIMPSON | 183 |
| Filling Factors and Ionized Masses of Planetary Nebulae – F.R. BOFFI, L. STANGHELLINI | 184 |
| Mean Electron Densities, Distances and Filling Factors for Galactic Planetary Nebulae – R.L. KINGSBURGH, M.J. BARLOW | 185 |
| The Ionization and Thermal Structure of NGC 2392 and NGC 3242 – X.-W. LIU, J. DANZIGER | 186 |
| Self-Consistent Photoionization Models of Planetary Nebulae Luminescence – V.V. GOLOVATY, Yu.F. MALKOV | 187 |
| Temperature Fluctuations in PN – R. GRUENWALD, S.M. VIEGAS | 188 |
| Radiation Charge Exchange and Radiation Ion-Atom Recombination as a Source of Continual E-M Radiation from Astrophysical Plasma – A.A. MIHAJLOV, M.S. DIMITRIJEVIC, A.M. ERMOLAEV | 189 |
| Observations of the Bowen Fluorescence Mechanism and Charge Transfer in Planetary Nebulae I. – X.-W. LIU, J. DANZIGER | 190 |
| Bowen Resonance Fluorescence Lines of OIII in Planetary Nebulae – C.R. O'DELL, C.O. MILLER | 191 |
| Dielectronic Recombination in the Gaseous Nebulae as a Cooling Process – A.F. KHOLTYGIN | 192 |
| High Dispersion Spectra of Bright Planetary Nebulae – S. HYUNG, L.H. ALLER | 193 |
| Imaging Spectrophotometry of the Ring Nebula – N.J. LAME, R.W. POGGE | 194 |
| Planetary Nebulae with the Strong [NII] Emission Lines – L.N. KONDRATJEVA | 195 |
| Probable Type I Planetary Nebulae – H. MORENO, A. GUTIERREZ- MORENO, G. CORTES | 196 |

| | |
|--|-----|
| Extended X-Ray Emission from Planetary Nebulae – H.C. KREYSING, C. DIESCH, J. ZWEIGLE, R. STAUBERT, M. GREWING | 197 |
| Spatial Variations in UV-Optical Lines across the Ring Nebula – R.J. DUFOUR, R. QUIGLEY | 198 |
| Collimating Discs and Bipolar Flows in SH 2-71 – L. CUESTA, J.P. PHILLIPS | 199 |
| M4-18: The Low Excitation PN around a WC11 Star – R. SURENDIRANATH, N. KAMESWARA RAO | 200 |
| Extended Nebulae around WC11 Stars: IRAS 17514-1555 – D.L. POLLACCO | 201 |
| Kinematics of the Planetary Nebula Hb 5. A Progress Report – P. PISMIS, M. MANTEIGA, A. MAMPASO, G. CRUZ-GONZALEZ | 202 |
| A Symmetric Jet-Like Structure in the Planetary Nebula FG-1 – J.A. LÓPEZ, M. TAPIA, M. ROTH | 203 |
| Monochromatic CCD Images of Three Planetary Nebulae – W.A. FEIBELMAN | 204 |
| High-Resolution CCD Imagery of NGC 6537 and NGC 7027 – S.R. HEAP | 205 |
| Optical Imagery of NGC 6302 – J. BOHIGAS | 206 |
| A Twodimensional Ionisation Model of NGC 2440 – M. BÄSSGEN, C. DIESCH, M. GREWING | 207 |
| Extended Structures in the Planetary Nebulae He2-111 and He2-119 – J.A. LÓPEZ, M. TAPIA, M. ROTH | 208 |
| CCD Imaging of Planetary Nebula Halos – K.B. KWITTER, Y.-H. CHU, R.A. DOWNES | 209 |
| Near- and Mid-Infrared Imaging of the PN IC 418 – J.L. HORA, L.K. DEUTSCH, W.F. HOFFMANN, G.G. FAZIO, K. SHIVANANDAN | 210 |
| Mid-IR (8-13 μ m) Images of Planetary Nebulae – M. MEIXNER, J.F. ARENS, J.G. JERNIGAN, J.R. BALL, C.J. SKINNER | 211 |
| Imaging of Magellanic Cloud Planetary Nebulae with the Hubble Space Telescope – M.A. DOPITA, S.J. MEATHERINGHAM, P.R. WOOD, H.C. FORD, R.C. BOHLIN, T.P. STECHER, S. MARAN, J.P. HARRINGTON | 212 |
| Hubble Space Telescope Images of Four Magellanic Cloud Planetary Nebulae – M.J. BARLOW, J.C. BLADES, S. OSMER, THE FAINT OBJECT CAMERA I.D.T. | 213 |
| H α Morphological Classification of Planetary Nebulae – H.E. SCHWARZ, R.L.M. CORRADI, L. STANGHELLINI | 214 |
| A PC-Based Quicklook-Program for PN Images – M. BÄSSGEN, M. BREMER | 215 |
| Point Symmetry in Planetary Nebulae – R.L.M. CORRADI, H.E. SCHWARZ, L. STANGHELLINI | 216 |
| Spectrophotometry and Multicolour Imagery of the Planetary Nebula around the P Cygni Star AG Carinae – C. ROSSI, A. ALTAMORE, R.D.D. COSTA, A. DAMINELI NETO, J.A. DE FREITAS PACHECO, | |

| | |
|---|------------|
| A. CASSATELLA, A.R. MARENZI, P. PERSI, V.F. POLCARO, R. VIOTTI | 217 |
| An Iterative Method for the Reconstruction of Two-Dimensional Density Distributions – M. BREMER, M. GREWING | 218 |
| Ring Nebulae Around Population I WR Stars: Is Their Origin Similar to the PNe? – T.A. LOZINSKAYA, M.A. DOPITA, Y.-H. CHU | 219 |
| Photodissociation Regions in Planetary Nebulae – V. ESCALANTE, A. GÓNGORA-T. | 220 |
| A Model of the Chemistry in the Neutral Shell of a Planetary Nebula – S.N. GOULDSWORTHY, D.R. FLOWER | 221 |
| CO Line Emission in Planetary and Proto-Planetary Nebulae: The Molecular Envelope – G. SILVESTRO, I. PORRO | 222 |
| CO Interferometric Maps of CIT 6 and CRL 618 – M. MEIXNER, W.J. WELCH | 223 |
| The Spatio-Kinematic Structure of the CO Envelopes in Evolved Planetary Nebulae – R. BACHILLER, P.J. HUGGINS, P. COX, T. FORVEILLE .. | 224 |
| High Resolution Observations of CO in PNe – K.M. SHIBATA, S. DEGUCHI, T. KASUGA, S. TAMURA, N. HIRANO, O. KAMEYA | 225 |
| 1.6–1.75 and 3.1–3.75 μm Spectrum of Hb 5 – A. MAGAZZÙ, G. STRAZZULLA | 226 |
| Chemistry in the Molecular Envelope of NGC 7027 – P. COX, R. BACHILLER, P.J. HUGGINS, A. OMONT, S. GUILLOTEAU .. | 227 |
| Axisymmetric Dust-Shells in Planetary Nebulae – W. HOPFENSITZ, M. GREWING | 228 |
| Molecular-Line Observations of the Remnant AGB Envelopes Around Planetary Nebulae – R. SAHAI, A. WOOTTON, R.E.S. CLEGG | 229 |
| NGC 7027: New 7.8 – 20.0 μm Array Camera and $H\alpha/H\beta$ CCD Image Analysis of Dust, PAH and Ionized Gas Distribution – D.Y. GEZARI, M.D. THORNLEY, S.R. HEAP, S.N. SHORE, F. VAROSI, S.J. MEATHERINGHAM, S.P. MARAN | 230 |
| Polarized Line Profiles in Planetary Nebulae – J.R. WALSH, R.E.S. CLEGG | 231 |
| Millimetre and Submillimetre Continuum Observations of Planetary Nebulae – M.G. HOARE, P.F. ROCHE, R.E.S. CLEGG | 232 |
| IV. PLANETARY NEBULAE CONNECTION: EVOLUTION FROM THE AGB | 233 |
| The Third Dredge-Up: Status and Problems – | |
| J.C. LATTANZIO | 235 |
| Carbon- and Oxygen-Rich Progenitors of Planetary Nebulae – | |
| H.J. HABING, J.A.D.L. BLOMMAERT | 243 |
| Planetary Nebulae from Miras? – P.A. WHITELOCK, M.W. FEAST | 251 |
| Evolution from the AGB: Variability – D.D. SASSELOV | 259 |
| Proto-Planetary Nebulae – S. KWOK | 263 |

| | |
|---|------------|
| Post-AGB Candidates – L.B.F.M. WATERS, K.C. SAHU | 271 |
| Planetary Nebulae with Binary Nuclei – M. LIVIO | 279 |
| Thermal Pulses and Planetary Nebula Ejection – P.R. WOOD, E. VASSILIADIS | 291 |
| Basic Problems of Planetary Nebula Gas Dynamics – J.E. DYSON | 299 |
| Interaction of Planetary Nebulae with the Interstellar Medium – K.J. BORKOWSKI | 307 |
| Spindles, Spheres and a Few Jets: The Radiation Gasdynamics of Planetary Nebulae – A. FRANK | 311 |
| Dynamical Structures of Planetary Nebulae – Models Against Observations – H. MARTEN, K. GESICKI, R. SZCZERBA | 315 |
| Mass-Losing AGB Stars in the Magellanic Clouds – N. REID | 319 |
| 10 μ m Images of AGB Stars & Supergiants – C.J. SKINNER, G. HAWKINS, M.M. MEIXNER, J.G. JERNIGAN, J.F. ARENS | 320 |
| Mid-IR Spectra of AGB and Post-AGB Stars – C.J. SKINNER, M.J. BARLOW, K. JUSTTANONT, R.J. SYLVESTER | 321 |
| Comparative Analysis Miras/PPN – D. BARTHES, M.O. MENNESSIER, F. GLEIZES, A. LÈBRE | 322 |
| Mechanisms for Radio Continuum Emission of Long-Period Variable Stars – G.M. RUDNITSKIJ | 323 |
| History of the Light Curves and Molecular Maser Emission of the Miras U Ori and R Leo – I.L. ANDRONOV, L.S. KUDASHKINA, G.M. RUDNITSKIJ | 323 |
| On the Possible Relationship between the Photometric Parameters of the AGB Stars and their Evolutionary Status – L.S. KUDASHKINA, I.L. ANDRONOV | 324 |
| Spline Fits: Modelling the Observations – I.L. ANDRONOV | 325 |
| Near IR-Photometry of Semiregular Variables – F. KERSCHBAUM, J. HRON | 326 |
| Space Distribution of Short Period Mira Variables – J. HRON | 327 |
| The Galactic Distribution of O-Rich AGB Stars – B.W. JIANG, J.Y. HU .. | 328 |
| Ice Mantle Formation in the Envelopes of OH/IR Stars – S.B. CHARNLEY, R.G. SMITH | 329 |
| First Results of a Near IR Monitoring Program of OH/IR Stars – P. GARCÍA-LARIO, D. ENGELS, A. MANCHADO | 330 |
| Planetary and Proto-Planetary Nebulae in the IRAS Two-Colour Diagram – P. GARCÍA-LARIO, A. MANCHADO, S.R. POTTASCH | 331 |
| A New Evolutionary Interpretation of the IRAS Two-Colour Diagram – P. GARCÍA-LARIO, A. MANCHADO, S.R. POTTASCH | 332 |
| A Systematic Study of IRAS Selected Proto-Planetary Nebula Candidates – J.Y. HU, B.W. JIANG, T. DE JONG, S. SLIJKHUIS | 333 |
| FI Lyr: A Candidate Binary System Consisting of Carbon-Rich and Oxygen-Rich Companions – J.J. WANG, J.Y. HU, X. ZHOU | 334 |

| | |
|---|-----|
| Near-Infrared Spectroscopy of Proto-Planetary Nebulae – B.J. HRIVNAK, S. KWOK, T.R. GEBALLE | 335 |
| High Resolution Optical Imaging of Proto-Planetary Nebulae – P.P. LANGILL, S. KWOK, B.J. HRIVNAK | 336 |
| On the Evolution of Proto-Planetary Nebulae – J.Y. HU, B.W. JIANG, S. SLIJKHUIS | 337 |
| The Molecular Features in the Optical Spectra of the Proto-Planetary Nebulae – J.Y. HU | 338 |
| Optical Spectroscopy of Six Carbon-Rich Proto-Planetary Nebulae – B.J. HRIVNAK | 339 |
| Near-Infrared Imaging of Proto-Planetary Nebulae – R.E.S. CLEGG, N.A. WALTON, M.J. BARLOW | 340 |
| Mid-Infrared Spectroscopy of Four 21 μ m Emission Band Sources – K. JUSTTANONT, M.J. BARLOW, C.J. SKINNER | 341 |
| UKIRT CGS3 Observations of New IRAS 21 Micron Sources – S. KWOK, B.J. HRIVNAK, T.R. GEBALLE, P.L. LANGILL | 342 |
| Mid-IR (8–13 μ m) Images of Proto-Planetary Nebulae – M. MEIXNER, J.F. ARENS, J.G. JERNIGAN, C.J. SKINNER, G. HAWKINS | 343 |
| The Morphology of MID-Infrared UIR Feature Emission in the PPN M 2-9 and IRAS 21282+5050 – L.K. DEUTSCH, J.L. HORA, W.F. HOFFMANN, G.G. FAZIO, K. SHIVANANDAN | 344 |
| Visual Extinction and Physical Conditions in the Bipolar Nebula M2-9 – A. RIERA | 345 |
| Complex Motions in Planetary Nebulae – V. ICKE | 346 |
| The Nature of the High Velocity Flow in CRL 618 – R. NERI, M. GUÉLIN, S. GUILLOTEAU, R. LUCAS, S. GARCIA-BURILLO, J. CERNICHARO | 347 |
| High Velocity Outflows in IRAS 17423-1755 – A. RIERA, P. GARCÍA- LARIO, A. MANCHADO, S.R. POTTASCH | 348 |
| Rotation-Pulsation Coupling in the Bipolar Preplanetary Nebula, V Hya – M. MORRIS, C. BARNBAUM | 349 |
| Influence of the Stellar Winds on the Post-AGB Evolution – R. SZCZERBA | 350 |
| Axially Symmetric Dynamics of PNe – L. WANG | 351 |
| The Chemical Composition of Post AGB Stars – M. PARTHASARATHY, P. GARCÍA-LARIO, S.R. POTTASCH | 352 |
| UBVRI Polarization Measurements of Post AGB Stars – M. PARTHASARATHY, S.K. JAIN | 353 |
| High-Resolution Radial Velocity and H α Study of Proto-Planetary Nebulae – B.J. HRIVNAK; A.W. WOODSWORTH | 354 |
| H α Profiles of Selected Candidates for Proto-Planetary Nebulae – S. TAMURA | 355 |
| LSIV -12° 111 – A Newly Emerging Halo Planetary Nebula – E.S. CONLON, P.L. DUFTON, F.P. KEENAN, R.J.H. McCausland | 356 |
| A Very Rapid-Evolving Young Planetary Nebula – A. MANCHADO, P. GARCÍA-LARIO, K.C. SAHU, S.R. POTTASCH | 357 |

| | |
|--|-----|
| Search for the Young Planetary Nebulae. Preliminary Results – L.N. KONDRATJEVA | 358 |
| About the Suspected Very Young PN IRAS 17516-2525 – H.U. KÄUFL, L. STANGHELLINI | 359 |
| A Spectroscopic Search for Hot (B-Type) Post-AGB Stars – E.S. CONLON | 360 |
| New Calculations of Thermal Pulses and s-Process Nucleosynthesis in AGB Stars – M. BUSSO, A. CHIEFFI, R. GALLINO, M. LIMONGI, C.M. RAITERI, O. STRANIERO | 361 |
| Evolutionary Properties of Post-AGB and Post-EAGB Stars – M. LIMONGI, A. TORNAMBE, M. CASTELLANI | 362 |
| Evolution of a Dust Shell along a Stellar Post-AGB Track – H. MARTEN, R. SZCZERBA, T. BLÖCKER | 363 |
| Dust Driven Mass Loss from Pulsating AGB-Stars – E.A. DORFI, M.U. FEUCHTINGER, S. HÖFNER | 364 |
| Is There a Connection Between Thermal Pulses and PNe Halos: an Approach to an Answer – A. FRANK, B. BALICK, W. VAN DER Veen | 365 |
| Linear Pulsation Periods of the Post-AGB Stars – M. TAKEUTI, R. TAKANO, S. TAMURA | 366 |
| Effects of New Opacity on the Post-AGB Evolution – M. KATO, I. HACHISU | 367 |
| Angular Momentum Loss in Post-Main Sequence Stellar Evolution through the PN Stage – M. VILLATA | 368 |
| Modelling PN Formation from Hydrodynamics and Radiation – G. MELLEMA | 369 |
| Evolution of Planetary Nebulae Envelopes: an Empirical Approach – V.V. GOLOVATY, Yu.F. MALKOV | 370 |
| Numerical Study of the Shaping of Planetary Nebulae – I.V. IGUMENSHCHEV | 371 |
| Deprojection of Planetary Nebula Images – K. VOLK, D.A. LEAHY | 372 |
| Twodimensional Axialsymmetrical Hydrodynamical Simulations of PN-Evolution – J. ZWEIGLE, M. BREMER, M. GREWING | 373 |
| Spherically Symmetric Kinematic Modelling of Planetary Nebulae – C. DIESCH, M. GREWING | 374 |
| Shock Modelling and High Resolution Spectroscopy of NGC 6905 – L. CUESTA, J.P. PHILLIPS | 375 |
| A Modelling of Expansion Velocities of Planetary Nebulae – K. GESICKI, R. SZCZERBA | 376 |
| Echelle Measurements of the Expansion Velocities of the Faint Giant Haloes of Planetary Nebulae – M. BRYCE, J. MEABURN, J.R. WALSH | 377 |
| Kinematical Studies of Planetary Nebulae Using Taurus+CCD – K.C. SAHU, J.R. WALSH, N.A. WALTON, S.R. POTTASCH | 378 |
| High-Dispersion Spectroscopy of IC 351 and NGC 3242, Planetaries with High Internal Motion – Y. YADOUMARU, S. TAMURA | 379 |
| Interaction of Planetary Nebulae with Prenebulae Debris – J. FIERRO ... | 380 |

| | |
|--|-----|
| The Magnetic Fields in the Envelopes of Proto-Planetary Nebulae – J.Y. HU | 381 |
| On Bipolar Jet Formation in Planetary Nebulae – G. PASCOLI | 382 |
| Stripping of a Planetary Nebula from the Globular Cluster M22 – K.J. BORKOWSKI, J.P. HARRINGTON, Z. TSVETANOV | 383 |
| A Detailed Study of the Galactic Planetary Nebula G 258-15.7 – P. LEISY, M. DENNEFELD | 384 |
| Shock Modelling of the Bipolar Outflow Source NGC 6537 – L. CUESTA, J.P. PHILLIPS | 385 |
| The Dust in the Hydrogen-Poor Ejecta of Abell 30 – J.P. HARRINGTON, K.J. BORKOWSKI, W.P. BLAIR, J. BREGMAN | 386 |
| The Central Region of the Planetary Nebula A58 – D.L. POLLACCO, P.W. HILL, R.E.S. CLEGG | 387 |
| Morphology & Kinematics of the ‘Born-Again’ Planetary Abell 78 – R.E.S. CLEGG, M.N. DEVANEY, A.P. DOEL, C.N. DUNLOP, J.V. MAJOR, R.M. MYERS, R.M. SHARPLES | 388 |
| The Formation of Single and Binary Nuclei of Planetary Nebulae – L.R. YUNGELSON, A.V. TUTUKOV | 389 |
| A Spectroscopic Study of Binary Star Planetary Nebulae – J.R. WALSH, N.A. WALTON, S.R. POTTASCH | 390 |
| The Peculiar Light Variation of the Planetary Nebula NGC 2346 – X.-L. HAO | 391 |
| New Eclipsing Phenomena of the Central Star in NGC 2346 – R. COSTERO, M. PEÑA, W.J. SCHUSTER, M. TAPIA, J. ECHEVARRIA, J. FIERRO | 392 |
| Observational Studies of Close Binary Central Stars of Planetary Nebulae: HFG 1 and A 63 – H.L. MALASAN, A. YAMASAKI | 393 |
| Imaging and Spectroscopy of Abell 63 (UU Sge) – N.A. WALTON, J.R. WALSH, S.R. POTTASCH | 394 |
| New Light on UU Sagittae – S.A. BELL, D.L. POLLACCO | 395 |
| Precataclysmic Binaries in the Centre of Planetary Nebulae – G. JASNIEWICZ, A. ACKER | 396 |
| The Abell 35-Type Planetary Nuclei – H.E. BOND, R. CIARDULLO, M.G. MEAKES | 397 |
| The IUE Ultraviolet Spectrum of PC 11 – M. PARTHASARATHY, S.R. POTTASCH, J. CLAVEL | 398 |
| On the Photometric Behaviour of the Central Star of the Planetary Nebula Sh2-71 – J. JURCSIK | 399 |
| On Some Links Between Symbiotic Stars and Planetary Nebulae – L. LEEDJÄRV | 400 |
| Is There Any Connection Between Planetary Nebulae and Symbiotic Stars? – M. FRIEDJUNG | 401 |
| Elemental Abundances in Symbiotic Stars – H.M. SCHMID, H. NUSSBAUMER | 402 |
| Diagnostic Diagrams for Planetary Nebulae and Symbiotic Stars – A. GUTIERREZ-MORENO, H. MORENO, G. CORTES | 403 |

| | |
|---|---------|
| On the Dereddening of Symbiotic Stars – D. RAYKOVA, B. RAYTCHEV | 404 |
| ROSAT Observations of Symbiotic Stars – K.F. BICKERT, R.E. STENCEL, R. LUTHARDT | 405 |
| The Active Phase of the Hot Component of Z Andromedae – T. FERNANDEZ-CASTRO, R. GONZALEZ-RIESTRA, A. CASSATELLA, A.R. TAYLOR, E.R. SEAQUIST | 406 |
| BZ Camelopardalis = 0623+71: The Cataclysmic Variable Inside a Bow-Shock Nebula – N.M. SHAKHOVSKOY, Y.S. EFIMOV, I.L. ANDRONOV, S.V. KOLESNIKOV | 407 |
| Theoretical Light Curves of Recurrent Novae – M. KATO | 408 |
| The Environs of Supernova Precursors – O.A. TSIOPA | 409 |
| Circumstellar Nebular Lines in the Optical Spectrum of SN 1987A – I. KHAN, H.W. DUERBECK | 410 |
| SN 1987A Deconvolved by MIM – H. GRATL, J. PFLEIDERER | 411 |
| V. PLANETARY NEBULAE CONNECTION: EVOLUTION TO WHITE DWARFS | 413 |
| Evolutionary Tracks – D. SCHÖNBERNER | 415 |
| Diagrams for Observational Testing of Evolution of Planetary Nebula Nuclei – R. TYLENDA | 423 |
| The Evolution of the Planetary Nebulae in the Magellanic Clouds and the Galactic Bulge – M.A. DOPITA | 433 |
| White Dwarf Central Stars – J.W. LIEBERT | 443 |
| On the Relation of Core Mass with Chemical Composition in PN – S.R. POTTASCH | 449 |
| Simulations of a Population of Planetary Nebulae – G. STASINSKA, R. TYLENDA | 461 |
| Hydrogen and Helium Burning Evolutionary Tracks – P.R. WOOD, E. VASSILIADIS | 465 |
| Further Models of Planetary Nebula Spectral Evolution – K. VOLK | 469 |
| Synthetic P-AGB Evolution – L. STANGHELLINI, A. RENZINI | 473 |
| Further Models of Planetary Nebula Spectral Evolution – K. VOLK | 477 |
| Evolution of 1-5 M_{\odot} Stars with Mass Loss – E. VASSILIADIS, P.R. WOOD | 478 |
| On the Fading of AGB Remnants – T. BLÖCKER, D. SCHÖNBERNER .. | 479 |
| Planetary Nebula Evolution Traced by Distance-Independent Parameters – C.Y. ZHANG, S. KWOK | 480 |
| Excitation Class of Nebulae as an Evolution Criterion – G.A. GURZADYAN, A.G. EGIKYAN | 481 |
| Morphology and Evolution of Planetary Nebulae – L. STANGHELLINI, R.L.M. CORRADI, H.E. SCHWARZ | 482 |
| Influence of the Stellar Winds on the Evolution of the Planetary Nebula Nuclei – S.K. GÓRNY | 483 |

| | |
|---|------------|
| Detection of Evolution of the Nucleus of NGC 2392 – S.R. HEAP | 484 |
| A Search for Optical-UV Fading of Central Stars – B. ALTNER, S.R. HEAP | 485 |
| The Central Stars of He 2-131 and He 2-138: Photometric Variations – R.G. HUTTON, R.H. MÉNDEZ | 486 |
| Time-Resolved CCD-Photometry of Planetary Nebula Nuclei – M.M. ROTH, T. SOFFNER, W. MITSCH | 487 |
| Variable Spectra of IC 4997 and NGC 6572 – S. HYUNG, L.H. ALLER, W.A. FEIBELMAN | 488 |
| A Search for Pulsations in O VI Planetary Nuclei – H.E. BOND, R. CIARDULLO | 489 |
| Global Photometric Campaigns on Pulsating Planetary Nuclei – R. CIARDULLO, H.E. BOND | 490 |
| Photoelectric Photometry of Five PNNi – R. SILVOTTI, C. BARTOLINI, F.R. BOFFI, G. COSENTINO, A. GUARNIERI, A. PICCIONI, L. STANGHELLINI | 491 |
| O VI Central Stars of Planetary Nebulae: NGC 2371 – L. STANGHELLINI, J.B. KALER, R.A. SHAW | 492 |
| Precision Asteroseismology of Pre-White Dwarfs and PN Central Stars – S.D. KAWALER, P.A. BRADLEY | 493 |
| A Spectacular Mass-Loss Event of the Central Star of Longmore 4 – K. WERNER, W.-R. HAMANN, U. HEBER, R. NAPIWOTZKI, T. RAUCH, U. WESSOLOWSKI | 494 |
| Discovery of a Planetary Nebula Associated with the White Dwarf GD 561 – R. NAPIWOTZKI, D. SCHÖNBERNER | 495 |
| A New PG1159-Type Central Star Discovered in the ROSAT XRT All Sky Survey: Non-LTE Analysis of X-Ray and Optical Spectra – K. WERNER, C. MOTCH, M. PAKULL | 496 |
| ROSAT Studies of the Composition and Structure of DA White Dwarf Atmospheres – C.J. DIAMOND, M.A. BARSTOW, A.E. SANSOM, M.C. MARSH, S.R. ROSEN, T.A. FLEMING, D. KOESTER, D.S. FINLEY, J.B. HOLBERG, K. KIDDER | 497 |
| HST FOS Observations of KPD0005+5106: A Subluminous WN-WC Descendant with Ongoing Mass Outflow? – E.M. SION, R.A. DOWNES | 498 |
| HST Observations of the Nuclei of EGB 6 (0950+139) and Abell 58 (V605 Aql) – H.E. BOND, M.G. MEAKES, J.W. LIEBERT, A. RENZINI | 499 |
| The Low Luminosity Central Star of the PN ESO166-21 – M.T. RUIZ, M. PEÑA, S. TORRES-PEIMBERT | 500 |
| VI. PLANETARY NEBULAE IN GALACTIC SYSTEMS | 501 |
| Luminosity Functions of Planetary Nebulae – G. JACOBY, R. CIARDULLO | 503 |

| | |
|---|-----|
| Why are Planetary Nebulae Poor Distance Indicators? – | |
| G.A. TAMMANN | 515 |
| Planetary Nebula Birth Rates in the Galaxy and Other Galaxies – | |
| M. PEIMBERT | 523 |
| Planetary Nebulae and Halo Dynamics in Early Type Galaxies – | |
| X. HUI, H.C. FORD | 533 |
| Dynamics of AGB Stars and Planetary Nebulae in the Galaxy – | |
| H. DEJONGHE | 541 |
| PN Abundances in Different Galactic Systems – R.E.S. CLEGG ... | 549 |
| How to Model the Chemical Evolution of Galaxies – | |
| J. KÖPPEN | 557 |
| Distribution of Planetary Nebulae Perpendicular to the Disk – | |
| D.C.V. MALLIK, S. CHATTERJEE | 567 |
| Kinematics of Disk Planetary Nebulae – W.J. MACIEL, C.M. DUTRA ... | 568 |
| Spectrophotometry and Kinematics of the Newly Discovered PN in the | |
| Outer Field of the LMC – M.A. DOPITA, E. VASSILIADIS, | |
| D.H. MORGAN | 569 |
| The Radial Velocities of Planetary Nebulae in NGC 3379 – | |
| R. CIARDULLO, G. JACOBY | 570 |
| UV and Optical Abundances for a Sample of Southern Galactic | |
| Planetary Nebulae – R.L. KINGSBURGH, M.J. BARLOW | 571 |
| Chemical Enrichment and Central Star Properties – C.Y. ZHANG | 572 |
| Determination of Element Abundances in Planetary Nebulae from | |
| Recombination Line Spectra – A.A. NIKITIN, A.F. KHOLTYGIN, | |
| A.A. SAPAR, T.KH. FEKLISTOVA | 573 |
| Clumps in the Planetary Nebulae – A.F. KHOLTYGIN, | |
| T.KH. FEKLISTOVA | 574 |
| The Chemical Features of Galactic Planetary Nebulae – P.R. AMNUEL ... | 575 |
| O, S, Ar from Planetary Nebulae Data and the Chemical Evolution of the | |
| Galactic Disk – J.A. DE FREITAS PACHECO | 576 |
| Evolution of Radial Abundances Gradients from Planetary Nebulae – | |
| W.J. MACIEL, J. KÖPPEN | 577 |
| Dependance of the Metallicity of Planetary Nebulae with the Galactic | |
| Height Above the Disk – F. CUISINIER, A. ACKER, J. KÖPPEN .. | 578 |
| Chemical Composition of Planetary Nebulae: A New Determination – | |
| V.V. GOLOVATY, Yu.F. MALKOV | 579 |
| Galactic Ba Enrichment from TP-AGB Stars – C.M. RAITERI, | |
| M. BUSSO, F. MATTEUCCI, R. GALLINO | 580 |
| Chemical Abundances in Galactic Bulge PN – N.A. WALTON, | |
| M.J. BARLOW, R.E.S. CLEGG | 581 |
| A Reanalysis of C/O Ratios in Planetary Nebulae – C. ROLA, | |
| G. STASINSKA | 582 |
| The Helium-to-Metals Enrichment Ratio in Planetary Nebulae – | |
| C.M.L. CHIAPPINI, W.J. MACIEL | 583 |

| | |
|---|-----|
| Spectrophotometry of Selected Planetary Nebulae of Type I in the Magellanic Clouds – S. TORRES-PEIMBERT, M. PEIMBERT, M.T. RUITZ, M. PEÑA | 584 |
| Synthetic AGB Evolution in the LMC: The Abundances of PN – M. GROENEWEGEN, T. DE JONG | 585 |
| Chemical Abundances of Planetary Nebulae in the LMC – J.A. DE FREITAS PACHECO, R.D.D. COSTA | 586 |
| The Evolution of Planetary Nebulae, Their Precursors and Their Progeny – A Commentary – I. IBEN, JR. | 587 |
| Author Index | 597 |
| Object Index | 601 |