Garching

Max-Planck-Institut für extraterrestrische Physik

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1 Einleitung

Das Max-Planck-Institut für extraterrestrische Physik (MPE) befaßte sich 2016 mit grundlegenden Themen der Astrophysik, die sich folgenden großen Wissenschaftsbereichen zuordnen lassen: (i) *Astrochemie, Gas und Staubprozesse im Interstellaren Medium*, (ii) *Entstehung von Sternen und Planetensystemen*, (iii) *Kompakte Objekte*, (iv) *Galaktisches Zentrum*, (v) *Aktive Galaxien*, (vi) *Galaxienentstehung und -entwicklung*, (vii) *Galaxienhaufen und Großräumige Struktur*, (viii) *Kosmologie und Dunkle Energie*.

Dabei werden überwiegend experimentelle Methoden angewandt, aber auch theoretische Untersuchungen durchgeführt. Der Name des Instituts bezieht sich einerseits auf den Gegenstand der Forschung: die Physik des Weltraums, andererseits auf die Forschungsmethoden: viele unserer Experimente werden notwendigerweise oberhalb der dichten, absorbierenden Erdatmosphäre mit Flugzeugen, Raketen, Satelliten und Raumsonden durchgeführt. In zunehmendem Maße setzen wir aber, vor allem im optischen, im Infrarotbereich und in der Astrochemie, auch Instrumente an erdgebundenen Teleskopen ein.

Methodisch lassen sich die Forschungsaktivitäten des MPE in mehrere Bereiche einteilen. In der beobachtenden Astrophysik, für die am MPE innovative Instrumente gebaut werden, wird die Strahlung entfernter Objekte mit Teleskopen in den Millimeter/Submillimeter-, Infrarot-, Optischen-, Röntgen- und Gammaspektralbereichen gemessen. Der hierbei überdeckte Teil des elektromagnetischen Spektrums umfasst mehr als zwölf Dekaden. Die untersuchten Objekte reichen von nahen Kometen bis zu den fernsten Quasaren, von winzigen Neutronensternen bis zu Galaxienhaufen, den größten bekannten Formationen im Kosmos. Theoretische Arbeiten liefern die Grundlagen zum Verständnis und Interpretation der Beobachtungen und Messungen. Die direkte Wechselwirkung von Beobachtern, Experimentatoren und Theoretikern im Hause ist ein Merkmal unseres Arbeitsstils und führt oft im direkten Wechselspiel von Hypothesen und Beobachtungstatsachen zu einem frühen Erkennen von Zusammenhängen und damit zu einer früzeitigen Identifikation vielversprechender neuer Forschungsrichtungen. Ergänzt werden unsere Forschungsaktivitäten durch Experimente im Labor, mit denen sowohl die aus Theorie und Beobachtungen gewonnenen Ergebnisse überprüft als auch Informationen und Erkenntnisse gewonnen werden, die wiederum in theoretische Modelle und die Dateninterpretation einfliessen.

Eine technologische Einrichtung des MPE ist von besonderer Bedeutung: Die 130 m lange Vakuumanlage *Panter* zum Test von Röntgenteleskopen in Neuried bei München. Fast alle röntgenastronomischen Experimente oder Teile davon wurden in dieser Anlage getestet.

Unter anderem durch diese Einrichtung findet ein Transfer von neuen Verfahren und Methoden in die industrielle Anwendung statt. Im Rahmen unserer Transferaktivitäten hielt das MPE 10 Patente am Ende von 2016.

Neben der Forschung nimmt unser Institut auch universitäre Ausbildungsaufgaben wahr. Mehr als zehn MPE-Wissenschaftler sind als Hochschullehrer an zahlreichen Universitäten tätig und betreuen studentische Forschungsarbeiten, wie z.B. Bachelor-, Master- und Doktorarbeiten. Die Mehrzahl davon an den beiden Münchner Universitäten, aber auch an anderen deutschen Hochschulen und sogar im Ausland. Darüber hinaus veranstalten wir spezielle Seminare und Symposien zu den im Institut behandelten Forschungsgebieten, häufig in Zusammenarbeit mit Universitätsinstituten. Unsere sehr erfolgreiche „International Max-Planck Research School (IMPRS) on Astrophysics“ an der Ludwig-Maximilians-Universität (LMU) München brachte eine wesentliche Intensivierung der Doktorandenausbildung im Raum Garching/München. An dieser im Jahre 2000 gegründeten „Graduate School“ sind neben unserem Institut und dem Max-Planck-Institut für Astrophysik (MPA) noch das Institut für Astronomie und Astrophysik der LMU und die Europäische Südsternwarte beteiligt. Mit typisch 70 Doktoranden in diesem Programm, wovon etwa 25 am MPE arbeiten, gehört die “IMPRS on Astrophysics“ zu den größten Einrichtungen dieser Art weltweit.

2 Personal und Ausstattung

2.1 Personalstand

Direktoren:

Prof. Dr. K. Nandra, (Geschäftsführung) Hochenergie-Astrophysik; Prof. Dr. R. Bender, Optische und Interpretative Astronomie; Prof. Dr. P. Caselli, Zentrum für Astrochemische Studien; Prof. Dr. R. Genzel, Infrarot- und Submillimeter-Astronomie; Prof. Dr. G. Haerendel (emeritiert); Prof. Dr. R. Lüst (emeritiert); Prof. Dr. G. Morfill (emeritiert); Prof. Dr. K. Pinkau (emeritiert); Prof. Dr. J. Trümper (emeritiert).

Auswärtige wissenschaftliche Mitglieder:

Prof. Dr. E. van Dishoeck (Universität Leiden, Niederlande); Prof. Dr. V. Fortov (IHED, Moskau, Russland); Prof. Dr. J. Kormendy (University of Texas at Austin, USA); Prof. Dr. R. Z. Sagdeev (University of Maryland, College Park, USA); Prof. Dr. M. Schmidt (CALTECH, Pasadena, USA); Dr. Karl Schuster (IRAM, Grenoble, Frankreich); Prof. Dr. Y. Tanaka (JSPS, Bonn; MPE, Deutschland).

Fachbeirat:

Prof. Dr. J. Bergeron (Institute d'Astrophysique de Paris, Frankreich); Prof. Dr. M. Colless (Austrialian Astronomical Observatory, Australien); Prof. Dr. N. Evans (University of Texas at Austin, USA); Prof. Dr. K. Freeman (Mt. Stromlo Observatory, Australien); Dr. N. Gehrels (NASA/GSFC, Greenbelt, USA); Prof. Dr. F. Harrison (CALTECH, USA); Prof. Dr. R. Kennicutt (University of Cambridge, UK); Prof. Dr. E. Quataert (University of California Berkeley, USA); Prof. Dr. G. Stacey (Cornell University, USA).

Fachübergreifende Fachbeiräte:

Prof. Dr. G. Anton (Universität Erlangen-Nürnberg, Deutschland); Prof. Dr. M. Perryman (ESA/ESTEC, Niederlande).

Kuratorium:

Dr. L. Baumgarten (ehemaliges Vorstandsmitglied DLR); Prof. Dr. A. Bode (Vizepräsident TU München); J. Breitkopf (Kayser-Threde GmbH, München); H-J. Dürrmeier (ehemalig Süddeutscher Verlag, München); Prof. Dr. W. Glatthaar (ehemaliger Präsident der Universität Witten/Herdecke, Stuttgart, Kuratoriumsvorsitzender); Min. Dirig. Dr. G. Gruppe (Bayerisches Staatsministerium für Wirtschaft, Infrastruktur, Verkehr und Technologie,

München); Prof. Dr. B. Huber (Rektor der LMU München); Dr. M. Mayer (ehemaliges Mitglied des Bundestages, Höhenkirchen); Min.Dir. J. Meyer (Bundesministerium für Wirtschaft und Technologie, Berlin); Prof. Dr. E. Rohkamm (Blohm & Voss GmbH, Hamburg).

Wissenschaftliche Mitarbeiter und Angestellte

A. Infrarot-und Sub-mm-Astronomie

Dr. M. Bauböck, Dr. S. Belli, Dr. S. Berta, Dr. T. Bisbas, Dr. L. Burtscher, Dr. C. Cazoletti, Dr. A. Contursi, Dr. R. Davies, S. Dengler, Dr. J.A. de Jong, Dr. J. Dexter, Dr. V. Doublier Pritchard, Dr. F. Eisenhauer, Dr. S. Faccini, Dipl.-Phys. H. Feuchtgruber, Dr. N. Förster Schreiber, Dr. E. George, Dr. S. Gillessen, Dr. J. Grácia Carpio, Dr. M. Habibi, Dr. M. Hartl, S. Harai-Ströbl, Dr. R. Herrera-Camus, A. Kleiser, Dr. D. Lutz, Dr. T. Müller, Dr. E. Nelson, Dr. G. Orban de Xivry, S. Osterhage, Dr. T. Ott, Dr. O. Pfuhl, Dr. S. Rabien, Dr. M. Rosensteiner, Dr. A. Schruba, Dr. T. Shimizu, Dr. E. Sturm, Dr. K. Tadaki, Dr. L. Tacconi, Dr. E. Wisnioski, Dr. E. Wuyts, Dipl.-Phys. S. Yazici, J. Zanker-Smith.

Doktoranden (D)/Master (M):

S. von Fellenberg (M.), D. Gräff (M.), A. Janssen (D.), A. Jimenez Rosales (D.), P. Lang (D.), M.-Y. Lin (D.), M. Lippa (D.), P. Plewa (D.), S. Schmalzl (M.), E. Sicheneder (M.), H. Übler (D.), I. Waisberg (D.), R. Worth-Davies (D.).

B. Hochenergie-Astrophysik

Dr. R. Andritschke, A. Bähr, Prof. Dr. W. Becker, Dr. A. Behrens, B. Boller, Prof. Dr. T. Boller, Dr. H. Bräuninger, F. Brimouille, Dr. H. Brunner, Dr. W. Burkert, Dr. V. Burwitz, Dr. S. Carpano, Dr. J. Chen, Dr. J. Chichuan, Dr. N. Clerc, Dr. W. Collmar, Dr. B. De Marco, Dr. A. Del Moro, Dr. K. Dennerl, Prof. Dr. R. Diehl, Dr. T. Dwelly, Dipl.-Ing. J. Eder, V. Emberger, Dr. T. Eraerds, Dr. G. Erfanianfar, W. Frankenhuizen, Dr. M. Freyberg, Dr. P. Friedrich, Dr. M. Fürmetz, R. Gaida, Dr. E. Gardner, Dr. A. Georgakakis, Dr. J. Graham, Dr. J. Greiner, Dr. C. Grossberger, Dr. A. Gueguen, Dr. F. Haberl, K. Hartmann, Dipl.-Math. G. Hartner, G. Hauser, Dr. A. von Kienlin, Dr. M. Klein, Dr. T. Kruehler, Dr. C. Maitra, Dr. N. Meidinger, Dr. A. Merloni, S. Ott, C. Pelliciary, Dipl.-Phys. E. Pfeffermann, Dr. G. Ponti, Dr. P. Predehl, Dr. L. Proserpio, Dr. A. Rau, J. Reiffers, Dr. J. Sanders, Dr. P. Schady, Dr. W. Treberspurg, A. Tüchler, Dr. R. Yates, Dr. X.-L. Zhang.

Doktoranden (D)/Master (M):

A. Augenstein (M.), L. Baronchelli (D.), L. Bauer (M.), M.G. Bernhardt (D.), J. Bodensteiner (M.), J. Bolmer (M.), E. Breunig (M.), D. Coffey (D.), C. Delvaux (D.), M. Ghaempanah (D.), F. Hofmann (D.), F. Käfer (D.), F. Knust (D.), C. Kohlmann (M.), D. Kroell (D.), E. Madarz (M.), G. Mantovani (D.), B. Menz (D.), M.-L. Menzel (D.), J. Müller-Seidlitz (D.), M. Pleintinger (M.), J. Riedl (D.), T. Schweyer (M.), T. Siegert (D.), T. Simm (D.), M. Tanga (D.), K. Toelge (M.), K. Varela (D.), G. Vasilopoulos (D.), P. Wiseman (D.), H.-F. Yu (D.).

C. Optische und Interpretative Astronomie

Dr. A. Beifiori, Dr. A. Bode, Dr. C. Bodendorf, Prof. Dr. H. Böhringer, Dipl.-Phys. A. Bohnet, Dr. A. Brucalassi, Dr. J. Chan, Dr. M. Fabricius, Dr. D. Farrow, Dr. M. Fossati, Dr. A. Galametz, Dr. N. Geis, Prof. Dr. O. Gerhard, O. Goldenbogen, Dr. Gracia-Carpio, Dr. F. Grupp, I. Hartung, Dr. U. Hopp, C. Ingram, J. Kaminski, Dr. R. Katterloher, Dr. J. Koppenhöfer, Dr. X. Mazzalay, Dr. T. Mendel, Dr. A. Monna, Dr. F. Montesano, B. Niebisch, Dr. C. Obermeier, Dr. M. Opitsch, M.Sc. D. Penka, Dr. A. Perez-Villegas, A. Piemonte, Dr. F. Raison, Dr. R. Saglia, Dr. S. Salazar, Dr. A. Sanchez, Dr. J. Snigula, Dr. J. Thomas, Dr. L. Wang, Dr. C. Wegg, I. Weiss, Prof. Dr. J. Weller, Dr. M. Wetzstein, Dipl.-Ing. C. Wimmer.

Doktoranden (D)/Master (M):

A. Arth (D.), R. Bolze (M.), M. Blana Diaz (D.), M. Fahrenschon (M.), F. Finozzi (D.), J. Grieb (D.), M. Häuser (D.), J. Hou (D.), H. Kellermann (D.), M. Kluge (D.), M. Kodric (D.), M. Lippich (D.), M. Portail (D.), C. Pulsoni (D.), G. Rosotti (M.), S. Salazar-Albornoz (D.), T. Simm (M.), I. Söldner-Rembold (D.), N. Wamsley (D.).

D. Zentrum für Astrochemische Studien

Dr. V. Ali-Lagoa, Dr. J. Bailey, Dr. N. Bailey, Dr. G. Bano Esplugues, Dr. L. Bizzocchi, Dr. R. Choudhury, Dr. F. de Oliveira Alves, Dr. M. Egner Goto, Dr. C. Endres, Dr. S. Feng, Dr. B.M. Giuliano, Dr. S. Hocuk, Dr. A. Ivlev, Dr. R. Kompaneets, Dr. J. Laas, Dr. V. Lattanzi, Dipl.-Ing. P. Maier, Dr. T. Müller, Dr. J. Pineda Fornerod, Dr. B. Riaz, Dr. T. Röcker, Dr. A. Schmiedeke, Dr. O. Sipilä, Dr. S. Spezzano, Dr. L. Szücs, Dr. W. Thi, Dr. A. Vasyunin, Dr. B. Zhao, Dr. S. Zhdanov.

Doktoranden (D)/Master (M):

C. Agurto Ganges (D.), A. Barnes (D.), A. Chacon Tanarro (D.), J. Chantzos (D.), A. Punanova (D.), D. Prudenzano (D.), E. Redaelli (M.), T. Schamberger (M.), V. Sokolov (D.).

E. Unabhängige Forschungsgruppen

a) Forschungsgruppe Prof. Dr. A. Burkert

Dr. A. Ballone, Prof. Dr. A. Burkert, Dr. G. Ogyia.

Doktoranden (D)/Master (M):

M. Behrendt (D.), S. Heigl (D.).

b) Forschungsgruppe Prof. Dr. J. Mohr

Dr. M. Klein, Prof. Dr. J. Mohr.

Doktoranden (D)/Master (M):

S. Grandis (D.), N. Gupta (D.).

F. Ingenieurbereiche und Werkstätten

a) Elektrotechnik

Dipl.-Ing. S. Albrecht, Dipl.-Ing. (FH) L. Barl, Dipl.-Ing. (FH) W. Bornemann, Dipl.-Ing. (FH) T. Burghardt, M.Sc. A. Buron, H. Cibooglu, D. Coutinho, A. Emslander, R. Gressmann, Dipl.-Ing. (FH) O. Hälker, Dipl.-Ing. (FH) O. Hans, M. Hengmith, Dipl.-Ing. (FH) S. Kellner, Dipl.-Ing. (FH) W. Kink, MSc. A. Koch, S. Krämer, P. Langer, Dipl.-Ing. (FH) S. Müller, F. Oberauer, Dipl.-Ing. (FH) S. Ott, H. Özdemir, Dr. M. Plattner (Leitung), Dipl.-Ing. (FH) C. Rau, Dipl.-Ing. (FH) J. Reiffers, P. Reiss, T. Rupprecht, M. Schneider, F. Schrey, V. Yaroshenko, J. Zanker-Smith, Dipl.-Ing. (FH) J. Ziegleder.

Doktoranden (D)/Master (M):

A. Avad (M.), A. Lederhuber (M.), U. Pervaiz (M.).

b) Mechanik

A. Alhamwi, R. Bayer, T. Blasi, A. Brara, B. Budau, S. Czempiel, C. Deysenroth, M. Deysenroth, Dipl-Ing. (FH) K. Dittrich, G. Dittrich, J. Eibl, P. Feldmeier, J. Gahl, Dipl.-Phys. H. Gemperlein, A. Goldbrunner, J. Hartwig, F. Haußmann, M. Honsberg, D. Huber, F.-X. Huber, Dipl.-Ing. H. Huber, H.-J. Kestler, T. Kratschmann, F. Leimböck, Dipl-Ing. (FH) B. Mican, Dipl.-Ing. (FH) S. Paßlack, Dipl.-Ing. (FH) A. Pflüger, Dipl.-Ing. (FH) D. Pietschner, M. Plangger, C. Rohe, R. Sandmair, A. Schneider, C. Schreib, Dr. J. Schubert (Leitung), W. Schunn, S. Senftleben, F. Soller, R. Strecker.

Doktoranden (D)/Master (M):

V. Hörmann (M.), K. März (M.).

c) Auszubildende

C. Fischer, C. Furchtsam, P. Kohnert, S. Lenzewski, T. Liebhold, F. Waldhör, C. Warmuth, J. Ziegmeier.

G. Zentrale DV-Gruppe

Dipl.-Ing. A. Agudo Berbel, H. Baumgartner, Dipl.-Phys. A. Bohnet, A. Kleiser, L. Klose, C. Kollmer, A. Oberauer, Dr. T. Ott, J. Paul, Dipl.-Ing. (FH) R. Sigl, Dr. H. Steinle, Dipl.-Ing. E. Wieprecht, Dipl.-Ing. (FH) E. Wiezorrek.

H. Öffentlichkeitsarbeit

E. Collmar, Dr. W. Collmar, Dr. H. Hämmerle.

I. Publikationsunterstützung

R. Hauner.

J. Bibliothek

C. Bartels, E. Blank.

K. Verwaltung und Allgemeine Dienste

G. Apold, A. Arturo, T. Bauer, M. Bauernfeind, L. Belscak, U. Cziasto, C. Eicher, M. Ertl, S. Fleischmann, S. Goldbrunner, M. Grasemann, M. Grohmann, H.-P. Gschnell, S. Hausmann, G. Hesseler, R. Hidasi, P. Hingerl, T. Jäkel, J. Jirsch, W. Karing, M. Keil, L. Kestler, V. Kliem, A. Krapivina, E. Kuhwald, E. Maier, D. Meindl, A. Nagy, A. Neun, J. Paschou, M. Peischl, C. Preisler, R. Rochner, P. Sandtner, B. Scheiner, A. Schmidt, S. Schwaiger, B. Seyfarth, R. Steinle, C. Stricker, F. Thiess, L. Thiess, J. Uhland, J.P. Vogt, H. Wanger (Leitung).

2.2 Gäste

Im Jahr 2016 besuchten 72 Gastwissenschaftler das MPE, mit Besuchszeiten von einigen Tagen bis zu einigen Monaten.

3 Preise, Auszeichnungen, Berufungen

Pfuhl, O.: MERAC-Preis, Europäische Astronomische Gesellschaft, Athen, Griechenland, Juli 2016.

Trümper, J.: Tycho Brahe Preis, Europäische Astronomische Gesellschaft, Athen, Griechenland, Juli 2016.

van Dishoeck, E.: John Bahcall Vorlesung, NASA GSFC, Greenbelt, USA, März 2016.

4 Lehrtätigkeit, Prüfungen und Gremientätigkeit

4.1 Lehrtätigkeiten

Becker, W.: Astrophysikalisches Doktorandenseminar mit den Studenten der *International Max-Planck Research School on Astrophysics*, LMU München WS 15/16, SS 16, WS 16/17; Endstadien der Sternentwicklung, LMU München WS 15/16.

Bender, R.: Astronomisches Kolloquium, LMU München WS 15/16, SS 16, WS 16/17; Astrophysikalisches Grundpraktikum, LMU München WS 15/16, SS 16, WS 16/17; Forschungsprojekt Masterarbeit, Anleitung zum wissenschaftlichen Arbeiten, LMU München WS 15/16, SS 16, WS 16/17; Grundlagen der fortgeschrittenen Astrophysik (Essential of Advanced Astrophysics), LMU München WS 15/16/, SS 16, WS 16/17; Ergänzung zur Vorlesung „Grundlagen der fortgeschrittenen Astrophysik“, LMU München WS 15/16, SS 16, WS 16/17; Astrophysikalisches Hauptseminar theoretisch und numerisch orientiert, „Tools in modern astrophysics“, LMU München WS 15/16, SS 16, WS 16/17; Begleitendes

Kolloquium zum Astrophysikalisches Hauptseminar theoretisch und numerisch orientiert, LMU München WS 15/16, SS 16, WS 16/17; Astrophysikalisches Hauptseminar experimentell und beobachtungsorientiert, „Tools in modern astrophysics“, LMU München WS 15/16, SS 16, WS 16/17; Begleitendes Kolloquium zum Astrophysikalisches Hauptseminar experimentell und beobachtungsorientiert, LMU München WS 15/16, SS 16, WS 16/17; Projektseminar mit begleitendem Kolloquium „Extragalactic group seminar“, LMU München SS 16; Projektseminar mit begleitenden Kolloquium „Gravitational lensing“, LMU München WS 15/16, SS 16; Projektseminar mit begleitenden Kolloquium „Galaxies“, LMU München WS 15/16, SS 16, WS 16/17; Projektseminar mit begleitenden Kolloquium aus dem Bereich experimenteller Arbeiten und Instrumentenentwicklung in der Astronomie, LMU München WS 15/16, SS 16, WS 16/17; Projektseminar mit begleitenden Kolloquium, vorbereitendes Kolloquium zur Masterarbeit mit Tutorium, Kolloquium und Tutorium aus dem Bereich der Kosmologie, Anleitung zum Wissenschaftlichen Arbeiten, LMU München WS 15/16, SS 16, WS 16/17; Projektseminar mit begleitenden Kolloquium, vorbereitendes Kolloquium zur Masterarbeit mit Tutorium, Kolloquium und Tutorium aus dem Bereich experimenteller Arbeiten, Anleitung zum wissenschaftlichen Arbeiten, LMU München WS 15/16, SS 16, WS 16/17; Galaxies, Vorlesung, LMU München WS 15/16; Ergänzung zur Vorlesung „Galaxies“, LMU München WS 15/16.

Boller, Th.: Strahlung und Materie, Astronomische Koordinatensysteme, Goethe-Universität Frankfurt WS 15/16; Strahlung und Materie, Goethe-Universität Frankfurt WS 15/16; The Physiscs of the Solar System, Goethe-Universität Frankfurt WS 15/16.

Dexter, J.: The Galactic Center, Universität Prag WS 15/16.

Diehl, R.: Astrophysics Seminar „Nuclei in the Cosmos“, TU München WS 15/16, SS 16, WS 16/17 (mit Dozenten vom MPE, MPA, LMU, TU); Nuclear Astrophysics, Universität von Sao Paolo WS 15/16; Nuclear Astrophysics, Universität von Tokio SS 16.

Eisenhauer, F.: Einführung in die Astrophysik, TU München WS 15/16, WS 16/17; High Angular Resolution Astronomy: Telescopes, Adaptive Optics, Interferometry, and more, TU München SS 16.

Genzel, R..: Galaxy evolution from the galaxies' perspective: from interstellar gas, to stars, to black holes and back, IMPRS für Astrophysik (Garching) WS 15/16.

Gerhard, O.: Projektseminar mit begleitendem Kolloquium “Stellar Dynamics“, LMU München SS 16, WS 16/17; Galactic Dynamics and Galaxy Evolution, IMPRS für Astrophysik (Garching), WS 15/16.

5 Wissenschaftliche Arbeiten

Die wissenschaftlichen Aktivitäten am MPE sind organisatorisch in vier große Arbeitsbereiche aufgeteilt, die jeweils von einem Direktor geleitet werden: (1) Infrarot- und Submm/mm Astronomie (Prof. Dr. Reinhard Genzel), (2) Optische und Interpretative Astronomie (Prof. Dr. Ralf Bender), (3) Hochenergieastrophysik (Prof. Dr. Kirpal Nandra) und (4) Zentrum für Astrochemische Studien (Prof. Dr. Paola Caselli). Diese vier Arbeitsbereiche, sowie noch zusätzlich zwei unabhängige Forschungsgruppen, beschäftigen sich – oft bereichsübergreifend – mit unseren acht großen Forschungsthemen (siehe „Einleitung“). Unsere Wissenschaft ist ausführlich auf unseren Internetseiten (`http://www.mpe.mpg.de`) unter dem Punkt „Forschung“ dargestellt. Wichtige Einzelergebnisse sind unter „MPE Forschungsmeldungen“ in zeitlicher Reihenfolge beschrieben.

6 Akademische Abschlussarbeiten

6.1 Bachelorarbeiten

Abgeschlossen:

Boeck, F.: Broadband study of Cassiopeia A. Technische Universität München 2016.

Christodoulou, A.: Supernova SN2014J and Positrons. Technische Universität München 2016

Philip, J.: Suche nach extrasolaren Planeten per Transitmethode und Periodenmessung von Bedeckungsveräderlichen Doppelsternen in M67. Ludwig-Maximilians-Universität München 2016.

6.2 Masterarbeiten

Abgeschlossen:

Augenstein, A.: Classifi cation of Background Lines in SPI/INTEGRAL. Technische Universität München 2016.

Floers, A.: Nebular Spectra of Type Ia Supernovae. Technische Universität München 2016.

Gräff, D.: Upgrade and Characterization of the SPIFFI/SINFONI Optics. Technische Universität München 2016.

Pleintinger, M.: Spectroscopy of an Emission Nebula. Technische Universität München 2016.

Schmalzl, S.: Development of Advanced Techniques for the Analysis of Imaging Spectrometer Data Obtained at the Very Large Telescope in Chile. Technische Universität München 2016.

Sicheneder, E.: An HII Region Model of Strong Interstellar Scattering towards the Galactic Center. Technische Universität München 2016.

Vogl, C.: Towards distance determinations of Type IIp Supernovae. Technische Universität München 2016.

6.3 Dissertationen

Abgeschlossen:

Bauböck, M.: The Effects of Spin on Neutron-Star Observations. University of Arizona, Tucson, USA 2016.

Belli, S.B.: Deep near-infrared spectroscopy of high-redshift galaxies: the physical growth of passive systems. California Institute of Technology, Pasadena, USA 2016.

Chan, C.C.: Constraining the formation and evolution of cluster galaxies at z $\sim$1.5 using sizes and colour gradients. Ludwig-Maximilians-Universität München 2016.

Fossati, M.: Environmentally driven suppression of starformation in galaxies over the last 10 billion years. Ludwig-Maximilians-Universität München 2016.

Grieb, J.N.: Anisotropic galaxy clustering measurements in Fourier space and cosmological implications from the BOSS DR12 sample. Ludwig-Maximilians-Universität München 2016.

Lang, P.: The Evolution of high-redshift galaxies from high-resolution near-infrared observations. Ludwig-Maximilians-Universität München 2016.

Mantovani, G.: Reflection signatures in bright Seyfert 1 galaxies observed with Suzaku and NuSTAR. Ludwig-Maximilians-Universität München 2016.

Menz, B.J.: Development of large area X-ray beam collimator. Technische Universität München 2016.

Menzel, M.-L.: Narrow line kinematics in a spectroscopic survey of X-ray selected AGN in the XMM-XXL North. Ludwig-Maximilians-Universität München 2016.

Obermeier, C.: Searching for hot Jupiter transits around cool stars. Ludwig-Maximilians-Universität München 2016.

Opitsch, M.O.: The bar of the Andromeda galaxy revealed by integral field spectroscopy. Ludwig-Maximilians-Universität München 2016.

Portail, M.P.: Structure and Dynamics of the Galactic Bulge and Bar. Ludwig-Maximilians-Universität München 2016.

Siegert, T.: Positron Annihilation Spectroscopy throughout the Milky Way. Technische Universität München 2016.

Salazar Albornoz, S.: A tomographic approach to the statistical analysis of the large-scale structure of the universe. Ludwig-Maximilians-Universität München 2016.

Yu, H.-F.: Constraints on the Prompt Emission Mechanism of Gamma-Ray Bursts using Time-Resolved Spectroscopy. Technische Universität München 2016.

7 Tagungen, Projekte am Institut und Beobachtungszeiten

7.1 Tagungen und Veranstaltungen

Astrochemistry with ALMA Cycle 4, Bordeaux, Frankreich, 12.01.-13.01.2016, Organisation: P. Caselli, A. Dutrey, D. Semenov, V. Wakelam.

Athena Wide Field Imager Proto-Consortium Meeting, Garching, Deutschland, 02.03.-04.03.2016, Orginisation: A. Rau, N. Meidinger, M. Plattner, K. Nandra.

Small Bodies Near and Far, IAA, Granada, Spanien, 13.04.-15.04.2016, Organisation: T.G. Müller, R. Duff ard. Follow-up of Wide-area X-ray Surveys, Ringberg Castle, 25.04.-27.04.2016, Organisation: A. Merloni, A. Finoguenov, M. Salvato.

The Cold Universe, Santa Barbara, CA, USA, 25.04.-15.07.2016, Organisation: P. Caselli, A. Ferrara, M. Ouchi, R. Schneider, J.C. Tan.

Unravelling Galaxies: Where Do the Stars Form?, Frauenchiemsee, Deutschland, 13.06.-15.06.2016, Organisation: D.J. Wilman, M. Fossati, G. Rudnick.

32nd Annual Conference of the IAP - Cosmic Dawn of the Galaxy Formation: Linking observations and theory with new-generation spectral models over cosmic time, Paris, Frankreich, 20.06.-24.06.2016, Orginisation: A. Bressan, J. Brinchmann, V. Bromm, S. Charlot, F. Combes, G. Ferland, N.M. Förster Schreiber, C. Leitherer, R. Maiolino, M. Pettini, A. Shapley, R. Somerville, D.P. Stark, M. Volonteri.

Active Galactic Nuclei: What's in a Name?, Garching, Deutschland, 27.06.-01.07.2016, Organisation: P. Padovani, E. Hatziminaoglou, V. Mainieri, M. Salvato.

Discs in Galaxies, 2016 Munich Joint Conference, Garching, Deutschland, 11.07.-15.07.2016, Organisation: A. Burkert, F. Combes, M. Dickinson, R. Ellis, B. Elmegreen, E. Emsellem, A. Helmi, L. Hernquist, G. Kauffmann, H.W. Rix, L. Tacconi.

Crossing the Rubicon: The Fate of Gas Flows in Galaxies, Santacangelo di Romagna, Italy, 05.09.-09.09.2016, Organisation: M. Brusa, F. Fraternali, J. Binnery, G. Chartas, J.X. Prochaska, A. Saintonge, R. Sancisi, D. Sijacki, L. Tacconi, E. Treister, and J. van Gorkom.

ESO-Athena Synergy Workshop, Garching, Deutschland, 14.09.-16.09.2016, Organisation: P. Padovani, F. Combes, M. Diaz-Trigo, S. Ettori, E. Hatziminaoglou, P. Jonker, M. Salvato, S. Viti.

Interstellar Shocks: Models, Observations, and Experiments, Torun, Poland, 14.09.-16.09.2016, Organisation: S. Cabrit, P. Caselli, A. Ciardi, E. van Dishoeck, H. Fraser, M. Gerin, V. Guillet, A. Gusdorf, M. Hanasz, A. Karska, M. Kaufman, L. Kristensen, A. Marcowith, D. Neufeld, L. Podio.

Workshop on Laboratory Astrophysics: Interstellar Gas, Dust and Ice, Ringberg Castle, Deutschland, 18.09.-20.09.2016, Organisation: P. Caselli, T. Giesen, C. Jaeger, H. Kreckel, H. Mutschke, S. Schlemmer, R. Rouille.

The Changing Face of Galaxies: Uncovering Transformational Physics, Hobart, Tasmania, Australia, 19.09.-23.09.2016, Organisation: S. Croom, J. Bland-Hawthorn, K. Bundy, S. Ellison, N.M. Förster Schreiber, R. Gonzalez-Delgado, M. Haynes, P. Hopkins, L. Kewley, T. Naab, C. Power, A. Saintonge, S. Shabala, R. Somerville.

Fractionation of Isotopologues in Space: From the Solar System to Galaxies, Florence, Italy, 10.10.-13.10.2016, Organisation: M. Bertran, F. Fontani, E. Bergin, D. Bockelee-Morvan, P. Caselli, C. Codella, S. Martin, T. Pillai, S. Schlemmer, L. Testi.

In Situ View of Galaxy Formation, Schloss Ringberg, Ringberg, Deutschland, 30.10.-05.11.2016, Organisation: N.M. Förster Schreiber, L.J. Tacconi, R. Bower, F. Combes, R. Ellis, R. Genzel, L. Kewley, T. Kodama, S. Lilly, D. Lutz, T. Naab, A. Renzini, R. Teyssier.

Nuclear Astrophysics in Deutschland, Darmstadt, Darmstadtium Convention Center, 15.11.-16.11.2016, Organisation: R. Diehl, R. Reifarth, C. Chiappini, N. Christlieb, G. Martinez Pinedo.

Small Bodies Near and Far, Nördlingen, Deutschland, 22.11.2016, Organisation: T.G. Müller, S. Hölzl.

The Hydride Toolbox, Paris, Frankreich, 12.12.2016, Organisation: Y. Aikawa, E. Bergin, J. Black, P. Caselli, M. Gerin, J. Goicoechea, E. Gonzalez-Alfonso, D. Li, X. Michaut, D. Neufeld, K. Öberg, E. van Dishoeck.

7.2 Projekte und Kooperationen mit anderen Instituten

Australien

Australian National University, Canberra: Galaxienentstehung.

CSIRO Astronomy and Space Science, Epping: CAS-Theorie.

Monash University, Melbourne: Nukleare Astrophysik.

Swinburne University of Technology, Victoria: Millisecond Pulsars.

University of Western Sydney: Magellanic Clouds.

Belgien

CSL Liège, Katholieke Universiteit Leuven: Herschel-PACS; INTEGRAL-Spectrometer SPI.

Brasilien

Observatorio Nacional, Rio: DES.

Centro Brasileiro de Pesquisas, Rio: DES.

Universidade Federal do Rio: DES.

Universidad de Sao Paulo: Galaxienenstehung.

Canada

Dunlap Observatory, Richmond Hill: First Hydrostatic Cores (FHSCs).

NRC - Herzberg, Ottawa: CAS Observations.

Queens's University, Kingston: CAS-Boebachtungen.

University of Alberta, Edmonton (Alberta): CAS-Boebachtungen.

University of Toronto: CAS-Boebachtungen.

University of Victoria, Victoria: CAS-Boebachtungen.

University of Waterloo, Waterloo: Herschel HIFI.

University of Western Ontario, London (Ontario): CAS-Boebachtungen; CAS-Theorie.

Chile

ESO, Joint ALMA Observatory, Santiago: CAS-Boebachtungen.

Universidad de Concepcion: Röntgen-Doppelsternsysteme.

Universidad Catolica Santiago: Röntgen-Doppelsternsysteme; Galaktisches Zentrum.

China

Donghua University, Shanghai: CAS-Theorie.

Institute for High-Energy Physics (IHEP), Peking: AGN und unidentifizierte Gammaquellen von COMPTEL und INTEGRAL.

Nanjing University, Nanjing: CAS-Boebachtungen.

Nationanal Observatory of China: Beijing: CAS-Boebachtungen.

University of Hongkong: Strahlungsmechanismen von Pulsaren vom Röntgen bis zum Gammabereich.

Dänemark

Dänemarks Technische Universität: ATHENA.

Deutschland

Astrophysikalisches Institut Potsdam: eROSITA; XMM-Newton; OPTIMA; ARGOS; HETDEX.

European Southern Observatory (ESO), Garching: GRAVITY; Galaxienentstehung; ASTROWISE; OmegaCAM; MICADO; Nukleare Astrophysik; ERIS; Black Hole Cam; Infrared Dark Clouds; CAS-Boebachtungen.

Fraunhofer Institut für Integrierte Schaltungen, Erlangen: Mikroelektronikentwicklungen; ATHENA.

Heinrich-Heine-Universität, Düsseldorf: Soft Matter Physics.

Institut für Astronomie und Astrophysik Tübingen (IAAT): XMM-Newton; eROSITA; ATHENA.

Institut für Astrophysik Göttingen: MICADO.

Institut für Festkörperphysik und Werkstoff-Forschung, Dresden: Entwicklung weichmagnetischer Werkstoffe.

Institut fur Materialphysik im Weltraum, Köln: Glasübergänge.

Landessternwarte Heidelberg-Königstuhl: Nahinfrarotspektrograph LUCI für LBT; Galaxienentstehung; ARGOS.

Laser Zentrum Hannover: Development of advanced Filters for MICADO; dichroics for ARGOS.

Ludwig-Maximilians-Universität (Universitäts-Sternwarte), München: MICADO; HETDEX; eROSITA.

Maier-Leibnitz Laboratorium, Garching: eROSITA.

Max-Planck-Institut für Astronomie, Heidelberg: GRAVITY; LUCI; Herschel-PACS; Pan-STARRS; SDSS; ARGOS; MICADO; EUCLID; CAS-Boebachtungen.

Max-Planck-Institut für Astrophysik, Garching: GAVO; SDSS; OPTIMA; eROSITA.

Max-Planck-Institut für Gravitationsphysik, Potsdam: Black Hole Cam.

Max-Planck-Institut für Physik (Werner Heisenberg Institut), München: MPI Halbleiterlabor; CAST; eROSITA; ATHENA.

Max-Planck-Institut für Radioastronomie, Bonn: ARGOS; Black Hole Cam; CAS-Observatioen.

Physikalisch-Technische Bundesanstalt Berlin: eROSITA.

Technische Universität Berlin: Interstellares Medium.

Technische Universität Darmstadt: CAST.

Technische Universität München: Nukleare Astrophysik; CAS-Projekte.

Thüringer Landessternwarte Tautenberg: GROND; Gamma-Ray Bursts.

Universität Bochum: LUCI.

Universität Bonn: Test von Pixeldetektoren für ATHENA; eROSITA; EUCLID.

Universität der Bundeswehr, München: CAS-Projekte.

Universität Düsseldorf: ERC Advanced Grant; CAS-Theorie.

Universität Erlangen (ECAP): eROSITA; ATHENA.

Universität Hamburg: eROSITA; OPTIMA (Flarestars).

Universität Heidelberg: ATHENA; XFEL; CAS-Boebachtungen; CAS-Theorie.

Universität Jena: Isolierte Neutronensterne; Nukleare Astrophysik.

Universität Köln: Galaktisches Zentrum; GRAVITY; CAS-Boebachtungen; CAS-Theorie; CAS-Labor.

Universität Mannheim: ATHENA; XFEL.

Universität Stuttgart: CAS-Projekte.

Universität Würzburg: AGADE.

Finnland

Universität of Helsinki, Helsinki: CAS-Theorie; CAS-Boebachtungen.

Frankreich

Aix-Marseille University, Marseille: CAS-Boebachtungen; CAS-Theorie.

CEA, Saclay: INTEGRAL-Spektrometer SPI; Herschel-PACS; CAST; EUCLID; ATHENA.

Centre d'Etude Spatiale des Rayonnements (UPS), Toulouse: INTEGRAL-Spektrometer SPI; CAS-Boebachtungen.

IAP Paris: Nukleare Astrophysik.

IAPG Grenoble: GRAVITY; MICADO; CAS-Boebachtungen; CAS-Theorie.

IRAM, Grenoble: CAS-Boebachtungen.

Laboratoire d'Astrophysique de Marseille (LAM): EUCLID; Gamma-Ray Bursts.

Laboratoire Univers et Particules de Montpellier, Montpellier: Cosmic-ray propagation in molecular clouds.

OAMP Marseille: Herschel-PACS.

Observatoire de Paris (GEPI): MICADO; GRAVITY..

Observatoire de Paris (LESIA): MICADO; GRAVITY; CAS-Theorie.

Observatoire de Paris-Meudon: GRAVITY; Galaktisches Zentrum.

University of Bordeaux, Bordeaux: CAS-Theorie.

Université de Cergy-Pontoise, Cergy Pontoise Cedex: CAS-Boebachtungen.

Universite Paris Diderot, Paris: CAS-Boebachtungen.

Université de Rennes, Rennes: CAS-Boebachtungen.

Université de Toulouse, Toulouse: CAS-Boebachtungen.

Griechenland

University of Crete and Foundation for Research and Technology Hellas (FORTH), Heraklion: Ausbau und Betrieb der Skinakas Sternwarte; Untersuchung von windakkretierenden Röntgendoppelsternsystemen; Entwicklung und Einsatz des OPTIMA Photometers; optische Identifikation und Monitoring von Röntgen-AGN; Novae.

Großbritannien

Queen's University, Belfast: PanSTARRS.

John Moores University, Liverpool: Himmelsdurchmusterung Galaxienhaufen; CAS-Boebachtungen.

Open University, Milton Keynes: Kataklysmische Veränderliche; Novae; ATHENA.

Queen Mary University of London, London: CAS-Boebachtungen.

Rutherford Appleton Laboratory, Council for the Central Laboratory of the Research Councils: SIS-Junctions.

United Kingdom Astronomy Technology Centre (UKATC): EUCLID; ERIS.

University of Cambridge: DES.

University College London, MSSL: High Energy Pulsars; EUCLID; DES; CAS-Boebachtungen.

University of Durham: PanSTARRS.

University of Edinburgh: DES; PanSTARRS.

University of Leeds: CAS-Boebachtungen; CAS-Theorie.

University of Leicester: XMM-Newton Datenanalyse; ATHENA; Swift.

University of Nottingham: DES.

University of Portsmouth: DES.

University of Sussex: DES.

University of Southampton: Magellanic Clouds.

Irak

University of AL-Muthanna, AL-Muthanna: CAS-Boebachtungen.

Irland

National University of Ireland, Galway: High Time Resolution Astronomy; CAS-Boebachtungen.

University College Dublin, Dublin: Fermi/GBM.

Israel

School of Physics and Astronomy, Wise Observatory, Tel Aviv: Aktive Galaxien; Galaxienentwicklung; Interstellares Medium.

Weizmann Institut, Rehovot: Galaktisches Zentrum.

Italien

Brera Astronomical Observatory: Himmelsdurchmusterung Galaxienhaufen.

IFCAI-CNR Palermo: XMM-Newton Beobachtungen von Neutronensternen und Pulsaren.

INAF (Insituto Nationale di Astrofisica): ATHENA, EUCLID.

INAF Arcetri: ARGOS; LBT; ERIS; CAS-Boebachtungen; CAS-Labor; CAS-Theorie.

INAF Padua: Herschel-PACS; ERIS; MICADO; LBT.

INAF Roma: LBT; Nukleare Astrophysik.

INAF Trieste: Gamma-Ray Bursts; Fermi/LAT.

INFR Frascati: SIDDHARTA.

Istituto di Fisica dello Spazio Interplanetario (CNR), Frascati: Herschel-PACS.

OAA/LENS Firenze: Herschel-PACS.

Scuola Normale Superiore, Pisa: CAS-Boebachtungen.

University Bologna: EUCLID; CAS-Labor; CAS-Boebachtungen.

Università di Torino, Torino: CAS-Boebachtungen.

Università di Firenze, Firenze: CAS-Boebachtungen.

Università di Perugia, Perugia: CAS-Boebachtungen.

Japan

Institute of Space and Astronautical Science, Kanagawa: CAS-Boebachtungen; CAS-Labor.

Institute of Physical and Chemical Research (RIKEN), Hirosawa: CAS-Boebachtungen.

National Astronomical Observatory of Japan, Mitaka/Tokio: CAS-Boebachtungen; CAS-Theorie; Galaxy Formation.

Tokio Institute of Technology (TITECH), Ookayama: ASCA/XMM-Newton Beobachtungen von AGN.

University of Osaka: Astro-H.

University of Tokyo, Tokyo: CAS-Boebachtungen.

Korea

Seoul National University, Seoul, Korea: CAS-Boebachtungen.

Kroatien

Ministry of Science and Technology, Zagreb: CAST.

Lettland

Ventspils University College, Ventspils: CAS-Theorie.

Mexiko

Universidad Nacional Autónoma de México, Jiquilpan: CAS-Theorie.

Niederlande

ESTEC, Noordwijk: XMM-Newton-TS-Spiegelkalibration; CCD Entwicklung; Radiation Performance Instrument; INTEGRAL; EUCLID.

JIVE Dwingeloo: Black Hole Cam.

NOVA (Leiden, Groningen, Amsterdam): MICADO; ERIS.

Leiden University, Leiden: CAS-Boebachtungen; CAS-Theorie.

Radboud University, Nijmegen: Black Hole Cam.

SRON, Utrecht: Chandra-LETG.

University of Groningen, Kapteyn Institute: Rekonstruktion der Dichteverteilung im Universum; EUCLID; CAS-Theorie; CAS-Boebachtungen.

Österreich

RICAM Linz: MICADO.

Universität und TU Wien: Herschel-PACS; MICADO; ATHENA.

Universität Innsbruck: MICADO.

Universität Linz: MICADO.

Polen

Nicolaus Copernicus (ZAMK), Torun: Pulsars Astronomical Centers; ATHENA.

University of Poznan, Poznan; CAS-Boebachtungen; CAS-Theorie.

University Zielona Gora: OPTIMA.

Portugal

Observatorio Astronomico de Lisboa, Lisbon: Athena.

SIM Lissabon: GRAVITY.

Russland

Institute of Astronomy, Moscow: CAS-Theorie.

Lebedev Institute of Physics, Moscow: CAS-Theorie.

Staatliche Technische Universität Bauman, Moscow: Stark gekoppelte Systeme; Time-domain spectroscopy; CAS-Theorie; CAS-Labor.

Space Research Institute (IKI) of the Russian Academy of Science, Moscow: eROSITA; Spectrum-Röntgen-Gamma.

Skobeltsyn Institute of Nuclear Physics, Moscow: Nukleare Astrophysik; Gamma-Ray Bursts; AGADE.

Ural Federal University, Yekaterinburg: CAS-Boebachtungen.

Schweden

University Lund/Observatory: OPTIMA.

Schweiz

CERN, Geneva: CAST.

ETH Zürich: ERIS.

Observatoire de Genève Sauverny, Geneva: ISDC/INTEGRAL; Nukleare Astrophysik; EUCLID.

Universität Basel: Nukleare Astrophysik.

Univrsity of Geneva: ATHENA.

University of Zurich: Infrared Dark Clouds.

Spanien

Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas: DES.

Centro de Astrobiologia (CSIC/INTA), Madrid: CAS-Labor.

Ernst & Young Spain, Barcelona: CAS-Projekte.

ESAC, Madrid: XMM-Newton Science Operations Center; INTEGRAL Science Operations Center; Herschel Science Operations Center; CAS-Boebachtungen.

Instituto de Astrofisica de Andalucia, Granada: CAS-Boebachtungen.

Instituto de Astrofisica de Canarias (IAC), Laguna: Herschel-PACS.

Instituto de Ciencias del Espacio, Bellaterra: DES; CAS-Boebachtungen.

Institut de Fisica d'Altes Energies, Barcelona: DES.

Universität Valencia, Valencia: INTEGRAL-Spektrometer SPI.

Universidad de Zaragoza: CAST.

Observatorio Astronomico de Mallorca: Novae; Kometen.

Observatorio Astronómico Nacional, Madrid: CAS-Boebachtungen.

Taiwan

Institute of Astronomy and Astrophysics (ASIAA), Taipei: CAS-Theorie; CAS-Boebachtungen.

National Central University, Chungli: PanSTARRS.

Tschechien

Charles University, Prague: CAS-Theorie.

Türkei

Bogazici University, Istanbul: CAST.

Ungarn

Konkoly Observatory: Herschel-PACS; CAS-Boebachtungen; CAS-Theorie.

USA

Argonne National Laboratory: DES.

Astronomical Sciences National Science Foundation, Arlington: CAS-Boebachtungen.

Brookhaven National Laboratory: strahlenharte JFET-Elektronik und Detektoren.

California Inst. of Technology, Pasadena: X-ray survey.

CfA, Cambridge: ATHENA WFI; XMM-Newton/Chandra Kalibration.

Clemson University: Gamma-Ray Bursts; Nukleare Astrophysik.

Fermilab, Batavia: DES.

Harvard University: PanSTARRS.

Harvard-Smithsonian Center for Astrophysics, Cambridge: Molecular cloud cores chemistry and dynamics.

Institute for Astronomy, Hawaii, Honolulu: Galaxienentstehung; PanSTARRS; NIR Kamera für Wendelstein.

Jet Propulsion Laboratory, Pasadena: EUCLID; CAS-Boebachtungen.

Johns Hopkins University: PanSTARRS.

Marshall Space Flight Center, Huntsville: Fermi Gamma-Ray Burst Monitor; XMM-Newton und Chandra Beobachtungen von Neutronensternen, Pulsaren und Supernovaüberresten.

NASA/Ames Research Center, Mofett Field (CA): MHD shocks; CAS-Boebachtungen.

NASA/Goddard Space Flight Center, Greenbelt, MD: INTEGRAL-Spektrometer SPI; Swift.

NASA Herschel Science Center (NHSC), Pasadena: Herschel/PACS.

National Radio Astronomy Observatory, Socorro: CAS-Boebachtungen.

NOAO, Tucson: DES.

Ohio State University, Columbus: DES; LBT.

Pacific Northwest National Laboratory (PNNL), Richland: CAST.

Pennsylvania State University: HETDEX; ATHENA/WFI; Swift.

Research Corporation, Tucson: LBT.

San Jose State University: MHD shocks.

SLAC, Stanford: CAMP; DES; ATHENA.

Smithsonian Astrophysical Observatory, Cambridge: Chandra-LETGS; Röntgendoppelsterne in M31; ATHENA.

Space Telescope Science Institute, Baltimore: Galaxienentstehung; PanSTARRS; CAS-Obsevations.

Stanford University: DES, Fermi/LAT; Fermi/GBM.

Texas A & M University, College Station: DES.

Texas State University, San Marcos: HETDEX.

University of Arizona, Tucson: Kosmische Strahlung; Planetenentstehung; LBT; ARGOS; CAS-Boebachtungen.

University of California, Berkeley: MPG/UCB-Kollaboration; FAST; INTEGRAL-Spektrometer SPI; Superbubbles.

University of California, Santa Cruz: DES.

University of Chicago: DES: CAS-Boebachtungen.

University of Colorado, Boulder (Co): Superbubbles.

University of Florida, Gainesville (Fl): CAS-Boebachtungen; CAS-Theorie.

University of Illinois at Urbana-Champaign: DES.

University of Massachusetts, Amherst: CAS-Boebachtungen.

University of Michigan: DES.

University of Pensylvania: DES.

University of Pittsburgh: Galaxienentstehung.

University of Texas, Austin: Galaxienentstehung; HETDEX.

University of Toledo: Galaxienentstehung.

University of Virginia, Charlottesville: CAS-Theorie.

Yale University, New Haven: CAS-Boebachtungen.

7.3 Multinationale Projekte

ARGOS – Laserleitstern für das LBT: API, LSW Heidelberg, MPIA, MPIfR, Germany; University of Arizona, USA.

ASPI – The International Wave Consortium: CNR-IFSI Frascati, Italy; LPCE/CNRS Orleans, France; Dept. of Automatic Control and Systems University of Sheffield, UK.

ATHENA – Advanced Telescope for High Energy Astrophysics: Dänemarks Technische Universität, Dänemark; Nikolaus Kopernikus Astronomical Center, Polen; Universität Wien, Österreich; IWF, Graz; INAF Italy, Italy; CEA Frankreich, Frankreich; University of Leicester, Open University, UK; Institut für Astronomie und Astrophysik Tübingen, Erlangen Centre for Astroparticle Physics (ECAP), Germany; ESA; NOA, Greece; Universität Geneva, Schweiz; Institute for Astrophysics, Portugal.

BOSS – Baryon Oscillation Spectroscopic Survey: SDSS-IV Collaboration.

CAST – CERN Solar Axion Telescope: CERN Geneva Switzerland; TU Darmstadt, MPI für Physik (WHI) München, Germany; Universidad de Zaragoza, Spain; Bogazici University Istanbul, Turkey; Ministry of Science and Technology Zagreb, Croatia; CEA/Sacklay DAPNIA/SED, France; Pacific Northwest National Laboratory, Richland, USA.

CDFS – The Chandra Deep Field South: ESO Garching, Astrophysikalisches Institut Potsdam, Germany; IAP Paris, France; Osservatorio Astronomico Trieste; Instituto Nazionale di Fisica Nucleare Trieste, Italy; Associated Universities Washington, Johns Hopkins University Baltimore, Space Telescope Science Institute Baltimore, USA; Center for Astrophysics Hefei, China.

Chandra X-ray Observatory: Marshall Space Flight Center Huntsville, Massachusetts Institute of Technology Cambridge, Smithsonian Astrophysical Observatory Cambridge, USA; Space Research Institute Utrecht, The Netherlands; Universität Hamburg, Germany.

COSMOS – Cosmic Evolution Survey: INAF-Osservatorio Astronomico di Bologna, INAF-Osservatorio Astronomico di Roma, INAF-Osservatorio Astrofisico di Arcetri, INAF/IASF-CNR, Sezione di Milano, IRA-INAF, Bologna, Dipartimento di Astronomia, Universita Padova, Dipartimento di Fisica, Universita degli Studi Roma Tre, Italy; Harvard-Smithsonian Centre for Astrophysics, Cambridge, Department of Physics, Carnegie Mellon University, Pittsburg, Institute for Astronomy, University of Hawaii, California Institute of Technology, Pasadena, Department of Astronomy, Yale University, USA; INTEGRAL Science Data Centre, Versoix, Switzerland; Laboratoire d'Astrophysique de Marseille, France.

DES – The Dark Energy Survey: LMU München, Excellence Cluster Universe, Germany; The Fermi National Accelerator Laboratory (Fermilab), University of Chicago, NOAO, University of Michigan, University of Pennsylvania, University of Illinois at Urbana-Champaign, Ohio State University, Texas A&M University, University of California Santa Cruz, Stanford University, SLAC National Accelerator Laboratory, The Lawrence Berkeley National Laboratory, Argonne National Laboratory, USA; University College London, University of Cambridge, University of Edinburgh, University of Portsmouth, University of Sussex, University of Nottingham, UK; Observatorio Nacional, Centro Brasileiro des Pesquisas Fisicas, Universidade Federal do Rio, Brasilien; Instituto de Ciencias dei Espacio, Institut de Fisica d'Altes Energies, Centro de Investigaciones Energeticas Medioambientales y Tecnologicas, Spain.

ERIS – Enhanced Resolution Imager and Spectograph for the VLT: ESO, Germany; ETH Zürich, Switzerland; INAF Arcetri (with OAA, OATe and OAPd), Italy; UKATC Edinburgh, Scotland; NOVA Leiden, The Netherlands.

eROSITA – extended ROentgen Survey with an Imaging Telescope Array: AIP Potsdam, Universität Bonn, Universität Erlangen, Universität Tübingen, Universität Hamburg, Remeis-Sternwarte Bamberg, MPA Garching, Germany; IKI Moskau, Russia.

EUCLID – ESA Mission to map the Dark Energy: ESA; CEA Saclay, LAM, France; University Bologna, INAF, Italy; MSSL, Durham University, UKATC, UK; STScI, USA; MPIA Heidelberg, Universität Bonn, Germany.

Fermi/GBM – Fermi Gamma-Ray Burst Monitor: Marshall Space Flight Center Huntsville, University of Huntsville, USA.

Fermi/LAT – Fermi Large Area Telescope: Stanford University Palo Alto, Naval Research Laboratory Washington DC, Sonoma State University Rohnert Park, Lockheed Martin Corporation Palo Alto, University of California Santa Cruz, University of Chicago, University of Maryland Greenbelt, NASA Ames Research Center Moffett Field, NASA Goddard Space Flight Center for High Energy Astrophysics Greenbelt, Boston University, University of Utah Salt Lake City, University of Washington Seattle, SLAC Particle Astrophysics Group Palo Alto, USA; ICTP and INFN Trieste, Istituto Nacionale di Fisica Nucleare Trieste, Italy; University of Tokyo, Japan; CEA Saclay, France.

FP7 Opticon JRA1 - Adaptive Optics: INAF Padova, INAF Arcetri, Italy; LAM Marseille, LAOG Grenoble; LESIA Paris, ONERA Paris, France; KIS Freiburg, MPIA Heidelberg, Germany; NOVA Leiden, The Netherlands; UKATC Edinburgh; University Durham, UK.

GRAVITY – Instrument for VLT Interferometry: MPIA Heidelberg, Universität Köln, ESO, Garching, Germany; SIM Lissabon und Porto, Portugal; IPAG, Grenoble, Observatoire de Paris / Meudon (LESIA), France.

Herschel/PACS – Herschel/Photodetector Array Camera and Spectrometer: CSL Liège, Katholieke Universiteit Leuven, Belgium; MPIA Heidelberg, Universität Jena, Germany; OAA/LENS Firenze, IFSI Roma, OAP Padova, Italy; IAC La Laguna, Spain; Universität und TU Wien, Austria; IGRAP Marseilles, CEA Saclay, France; Konkoly Observatory, Hungary; NHSC Pasadena, USA.

HETDEX – Hobby-Eberly Telescope Dark Energy Experiment: University of Texas, Austin, Pennsylvania State University, Texas A&M University, USA; AIP Potsdam, LMU, USM, Germany.

INTAS – Cooperation of Western and Eastern European Scientist: France, Germany, Norway, Russia.

ISDC – INTEGRAL Science Data Centre: Observatoire de Geneva Sauverny, Switzerland; Service d'Astrophysique Centre d'Etudes de Saclay, France; Rutherford Appleton Laboratory Oxon Dept. of Physics University Southhampton, UK; Institut für Astronomie und Astrophysik Tübingen, Germany; Danish Space Research Institute Lyngby, Denmark; University College Dublin, Ireland; Istituto di Fisica Milano, Istituto die Astrofisica Spatiale Frascati, Italy; N. Copernikus Astronomical Center Warsaw, Poland; Space Research Institute of the Russian Academy of Sciences Moscow, Russia; Laboratory for High Energy Astrophysics GSFC Greenbelt, USA.

INTEGRAL-Spectrometer SPI: Centre d'Etude Spatiale des Rayonnements (CESR) Toulouse, CEA Saclay Gif-sur-Yvette, France; University de Valencia Burjassot, Spain.

LBT – Large Binocular Telescope Project: MPIA Heidelberg, MPIfR Bonn, Landessternwarte Heidelberg Königstuhl, Astrophysikalisches Institut Potsdam, Germany; University of Arizona Tucson, Ohio State University, Columbus, Research Corporation USA; INAF, Italy.

Lockman Hole, optical/NIR identifications: Astrophysikalisches Institut Potsdam, ESO Garching, Germany; Istituto di Radioastronomia del CNR Bologna, Italien; Associated Universities Washington, California Institute of Technology Pasadena, Institute for Astronomy Honolulu, Princeton University Observatory, Pennsylvania State University Park, USA; Subaru Telescope NAO Hilo, Japan.

LUCI (Instrument for LBT): LSW Heidelberg, MPIA, Universität Bochum, Germany.

MICADO – Multi-Adaptive Optics Imaging Camera for Deep Observations: LMU (USM), MPIA Heidelberg, IFA Göttingen, Germany; INAF-OAPD Padova, Italy; A* (partnership of University Vienna, University Innsbruck, University Linz and RICAM Linz), Austria; NOVA (federation of Dutch university astronomy departments of the universitys in Amsterdam, Groningen, Leiden, Nijmegen), The Netherlands; CNRS/INSU (representing LESIA, GEPI and IPAG), Paris, France.

MXT – Microchannel X-Ray Telescope for Gamma-Ray Bursts: CEA, Saclay, France; University of Leicester, UK.

OPTIMA – Optical Pulsar TIMing Analyzer: Astrophysikalisches Institut Potsdam, MPI für Astrophysik, Universität Hamburg, Germany; University of Crete, Greece; University Zielona Gora, Poland; University Lund/Observatory, Schweden.

PanSTARRS – Panoramic Survey Telescope & Rapid Response System: MPIA Heidelberg, Germany; University of Hawaii, Harvard University, Johns Hopkins Univ. Baltimore, MD, USA; Universities of Durham, Edinburgh, Belfast, UK.

SDSS – Sloan Digital Sky Survey: MPA Garching, MPIA Heidelberg, Germany; Univ. of Washington, Seattle, Fermi National Accelerator Laboratory, Batavia, Univ. of Michigan, Ann Arbor, Carnegie Mellon Univ., Pittsburgh, Penn State Univ., University Park, Princeton Univ. Observatory, Princeton, The Institute of Advanced Study Princeton, Space Telescope Science Institute, Baltimore, Johns Hopkins Univ. Baltimore, USA.

Swift – Gamma-Ray Burst Mission: NASA/GSFC Greenbelt, Penn State University, USA; University of Leicester, Mullard Space Science Laboratory London, UK; Osservatorio Astronomico Brera, Italy.

XMM-Newton/Survey Science Center (SSC): Astrophysikalisches Institut Potsdam, Germany; SAP Saclay, CDS Strasbourg, CESR Toulouse, France; University of Leicester, Institute of Astronomy Cambridge, MSSL London, UK.

XMM-Newton/European Photo Imaging Camera (EPIC): SAP Saclay, IAS Orsay, CESR Toulouse, France; University of Leicester, University Birmingham, UK; CNR Mailand-Palermo-Bologna-Frascati, Osservatorio Astronomico Mailand, Italy; Institut für Astronomie und Astrophysik Tübingen, Germany.

7.4 Projekte mit der Industrie

3d shape GmbH, Erlangen: Metrology for slumped glass mirror study.

4D Engineering, Gilching, Germany: Software development for GRAVITY.

ABN GmbH, Neuried: Betreuung der Testanlage PANTER.

af inventions, Braunschweig: FPGA programmierung for eROSITA.

Airbus Defense and Space, München: EUCLID design study; eROSITA.

AMOS, Liège, Belgium: High resolution grating for ERIS.

Array Electronics, Egmanting: DAQ development OPTIMA.

BASF Coatings AG, Münster: Untersuchung der Streueigenschaften von Mikropartikeln.

Buchberger GmbH, Tuchenbach: Fertigung Strukturteile für PANTER-Manipulatore.

Dico-Solutions, München: Elektronikentwicklung für eROSITA.

ESL GmbH, Berlin: Fertigung von Leiterplatten.

Fraunhofer IOF, Jena: Coating for ERIS.

Freyer GmbH, Tuningen: PANTER; parts for LUCI; eROSITA.

Guido Lex Werkzeugbau GmbH, Miesbach: Strukturteile für LUCI; eROSITA.

Hans Englett OHG, Berlin: Fertigung von Frontplatten und Meßvorrichtungen.

HPS München: Multi-Layer Insulation (MLI) for eROSITA.

IABG, Ottobrunn: Umgebungs-Tests eROSITA.

Ingenieurbüro Buttler, Essen: Front-End Elektronikentwicklung (ATHENA, eROSITA).

Ingenieurbüro Josef Eder, Hilgertshausen: System Engeneering for eROSITA; GRAVITY; ATHENA; ERIS.

Ingenieurbüro Weisz, München: Design and mechanical engineering for LUCI, ERIS and MICADO.

Invent GmbH, Braunschweig: CFRP-Telescopestructure for eROSITA.

IRIDIAN Spectral Technologies, Ottawa, Canada: Fitters for ERIS Spectrometer.

Korth Kristalle GmbH, Kiel: Lenses for ERIS Spectrometer.

Kugler GmbH, Salem: ERIS.

Laser Components GmbH, Olching: ERIS Filters.

Laserjob GmbH, Grafrath: Entwicklung Röntgenbaffle für eROSITA.

Luxel Corporation, USA: Filter for eROSITA.

Media Lario Technologies, Borisio Parini, Italy: eROSITA mirror system.

MOOG Inc., East Aurora, USA: high pressure valves for eROSITA.

PNSensor, München: Entwicklung und Fertigung von Halbleiterdetektoren; Montage von Halbleiterdetektorsystemen; ARGOS.

RUAG Austria: Teleskop-Deckel-Mechanismus für eROSITA.

Sacher Lasertechnik, Marburg: Metrology Laser for GRAVITY.

Technotron, Lindau: Entwicklung und Fertigung der Platinen Layouts für eROSITA.

8 Veröffentlichungen

8.1 In Zeitschriften und Büchern

Abbott, P.B., R. Abbott, T.D. Abbott, ..., J. Greiner, A. von Kienlin, K. Toelge, H.-F. Yu, ..., A. Rau, A. von Kienlin, X. Zhang, ..., T.-W. Chen, et al.: Localization and Broadband Follow-up of the Gravitational-wave Transient GW150914. Ap. J. 826, L13 (2016).

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8.4 Populärwissenschaftliche und sonstige Veröffentlichungen

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8.5 Vorträge, Astronomische Telegramme und Zirkulare, Poster

Mitarbeiter des MPE hielten im Jahr 2016 insgesamt 313 Vorträge auf Konferenzen, bei Seminaren und Kolloquien und in der Öffentlichkeitsarbeit im In- und Ausland. Zusätzlich haben sie an insgesamt 144 astronomischen Telegrammen, Zirkularen und Datenkatalogen mitgewirkt und 29 Poster als Erstautoren auf Konferenzen präsentiert. Die Zahlen, verteilt auf die einzelnen Arbeitsbereiche, sind in Tabelle 1 gelistet. Die Zahlen in Klammern geben die eingeladenen Vorträge (bei Konferenzen und zu Kolloquien) an, sowie die Zahl der Erstautorschaften bei Telegrammen und Zirkularen.

Die vollständige Liste der Vorträge, der astronomischen Telegramme und Zirkulare sowie der Poster kann auf der MPE Internetseite (`http://www.mpe.mpg.de`) unter dem Punkt „Forschung/Veröffentlichungen" eingesehen werden.

Tabelle 1: Vorträge, Telegramme/Zirkulare und Poster

Arbeitsgruppe	Vorträge	Telegramme, Zirkulare	Poster
Infrarot-/Submillimeter-Astronomie	113 (81))	16 (4)	9
Optische & Interpretative Astronomie	20 (10)	4 (0)	3
Hochenergieastrophysik	105 (60)	117 (53)	7
Zentrum Astrochemische Studien	73 (32)	6 (3)	9
Unabhängige Forschungsgruppen	2 (02)	1 (0)	1

9 Öffentlichkeitsarbeit

Das MPE engagierte sich auch in der Öffentlichkeitsarbeit. Im Jahr 2016 hielten MPE-Wissenschaftler 25 populärwissenschaftliche Vorträge (z.B. an Schulen, Planetarien, bei Astronomischen Vereinigungen). Bei 22 Institutsführungen gewannen Gruppen, hauptsächlich Schulklassen von naturwissenschaftlich orientierten Schulen, einen Einblick in das Institut und seine Wissenschaft. Am „Girls' Day" informierten sich 40 Mädchen über das MPE, 13 Schüler/innen erhielten in ein- oder zweiwöchigen Praktika und 8 Hochschüler in mehrwöchigen Praktika einen Einblick in die Arbeitswelt von Astrophysikern.

Weitere Informationen zur Öffentlichkeitsarbeit sind auf den MPE Webseiten zu finden (`http://www.mpe.mpg.de/`).

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