

Annual Report 2008

**Leiden Observatory
(Sterrewacht Leiden)**



**Research Institute Leiden Observatory
(Onderzoekinstituut Sterrewacht Leiden)**

Annual Report 2008



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Cover: April 6, 2009: The main dome of the Sterrewacht building being lifted off the building in preparation for a thorough restoration. This event marked the start of the restoration project of the building, which is expected to last two years. Once restored the venerable telescopes will once again be available for use by students and local amateur astronomers.

The crane operator (not visible in the picture) was minister Plasterk of education, culture and science.

An electronic version of this annual report is available on the web at <http://www.strw.leidenuniv.nl/research/annualreport.php?node=23>

Production Annual Report 2008:

A. van der Tang, F.P. Israel, A. van Genderen, J. Lub, E. van Uitert

Sterrewacht Leiden

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Contents:

Part I		1
Chapter		1
1	Review of major events	3
1.1	Theodore Walraven	3
1.2	Foreword	9
1.3	A tribute to Jet Katgert on her 65 th birthday	15
Chapter		2
1	History and heritage	23
2	Planetary Systems	23
2.1	Solar System	23
2.2	Extrasolar Planets	24
2.3	Observing Protoplanetary Disks	24
2.4	Modelling Protoplanetary Disks	26
3	Star formation and circumstellar matter	28
3.1	Circumstellar gas	28
3.2	Embedded young stellar objects (YSO)	30
4	Stars	31
4.1	Observing the stars	31
4.2	Modelling binary stars	32

CONTENTS

4.3	Compact objects	34
5	Nearby galaxies	36
5.1	The Milky Way	36
5.2	The local Group	37
5.3	Detailed studies	38
5.4	General Galaxy Properties	42
6	Distant galaxies	51
7	Models and simulations	61
8	Projects and instrumentation	65
8.1	Projects	65
8.2	Facilities	68
8.3	Instrumentation	71
8.4	Space	72
9	Raymond and Beverly Sackler Laboratory	75
Chapter		3
3	Education, popularization and social events	81
3.1	Education	81
3.2	Degrees Awarded in 2008	83
3.3	Courses and teaching	86
3.4	Popularization and Media Contacts	88
3.5	Univers Awareness Program	93
3.5	The Leidsche Astronomisch Dispuut 'F. Kaiser'	94
3.6	Vereniging van Oud-Sterrewachters	94
3.7	Werkgroep Leidse Sterrewacht	94

CONTENTS

Part II

Appendix

I	Observatory staff December 31, 2007	99
II	Committee membership	109
II.1	Observatory Committees	109
II.2	University Committees	113
III	Science policy functions	119
IV	Visiting scientists	129
V	Workshops, colloquia and lectures	133
V.1	Workshops	133
V.2	Endowed lectures	135
V.3	Scientific colloquia	135
V.4	Student colloquia	138
VI	Participation in scientific meetings	143
VII	Observing sessions abroad	163
VIII	Working visits abroad	169
IX	Colloquia given outside Leiden	181
X	Scientific publications	191
X.1	Ph.D. Theses and Books	191
X.2	Articles in Refereed Journals	192
X.3	Conference Papers, Review Articles, etc.	208
X.4	Astronomical Catalogues	214
X.5	Other Publications	215



Chapter **1**

Review
of

Sterrewacht
major events
Leiden

Review of major events

Chapter 1

1. Theodore Walraven

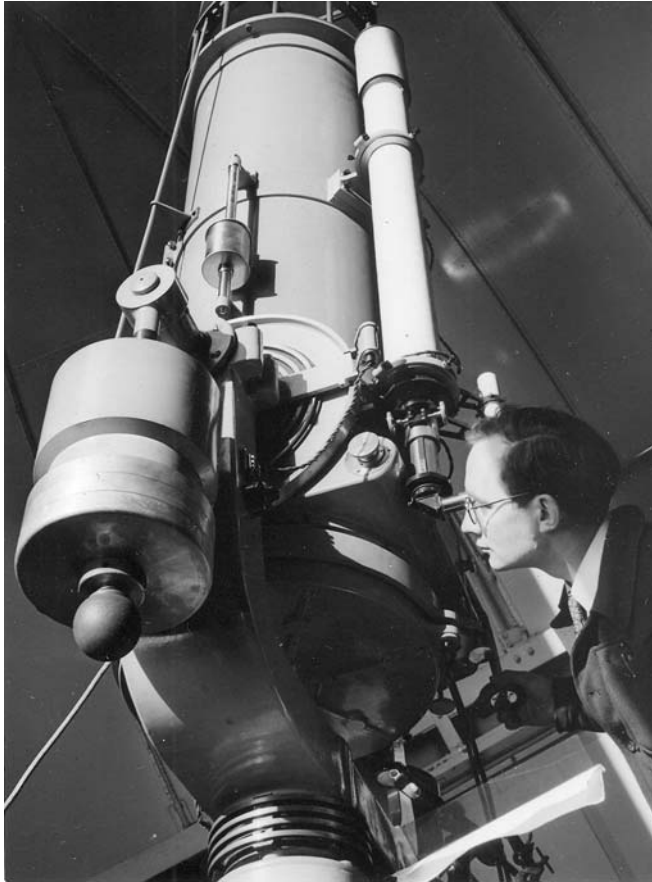
Theodore (Fjeda) Walraven passed away at his home near Pretoria in South-Africa on Sunday, January 13 2008.

He was born on July 26 1916, joined the Leiden Observatory in 1946 and retired as a full professor in 1980. His last lectures in Leiden were delivered during a visit from South Africa in the first half of 1990.

His first big work was on variable stars. He wrote his thesis on the 'Line Spectrum of Delta Cephei' under the supervision of Anton Pannekoek in Amsterdam, which was published as Publications of the Astronomical Institute of the University of Amsterdam vol. 8 pp. 1-80 in 1948. Ever since he contributed to a wide variety of observational astronomical projects and instruments.

Fjeda was a pioneer of high-precision photoelectric photometry and a genius in instrumentation. He contributed in a fundamental

way to our insight into variable stars. Together with Paul Ledoux he wrote the famous article on stellar variability in the *Handbuch der Physik*, Volume 51 pp. 353-604, published in 1958.



His observational efforts started with the remarkable studies using the then recently built Zunderman 19" reflector of multiperiodic variability of RR Lyrae. His observations and description of the Blazhko effect were unsurpassed until recently. He invented simple methods to achieve continuous registration of the star's brightness, which he later applied impressively in his studies from

the Leiden Southern Station at Johannesburg of SX Phoenicis and AI Velorum, which both appeared to be double-mode pulsators. His whole life he would remain fascinated by these stars, improving until the last moment the special instrumentation he built to study them.

During the mid 1950's he also developed a special photometer-polarimeter with which he studied in detail the polarization of the Crab Nebula. Together with Jan Oort this led to the understanding of the importance the synchrotron radiation in the Crab nebula. The landmark paper by Oort and Walraven (B.A.N. 462, 1956) stands to this day as a classical example of well-conducted research. Remarkably, the first crucial observations of the Crab were again made from Leiden in 1954, on the 13-inch refractor; the bulk of the data were obtained later at the Observatoire de Haute Provence.

At the Leiden Southern Station a wide variety of photometric programs were executed among which stands out the study with Muller and Oosterhoff of the southern classical Cepheids. The large number of photometric studies being considered led to the design of the 36 inch reflecting telescope, the "Lightcollector", at the new site of the Leiden Southern Station near Hartebeespoortdam, where it was erected in 1957. This telescope, built by Rademakers in Rotterdam, was fast, versatile and optimized for photoelectric photometry with small diaphragms.

Walraven's great achievement was to build around this telescope a multichannel photometer, based upon a polarization optics filter which split the stellar spectrum into a set of regular bands which could be measured simultaneously. This yielded a five-channel photometric system of very high stability and efficiency that was particularly suited for determination of the physical parameters of

stellar photospheres. The bands were chosen as a photoelectric analogue of the Barbier-Chalonge-Divan (BCD) classification based upon photographic spectrum registrations (at the Observatoire de Haute Provence).

In order to get the maximum of results from telescope and photometer, Walraven went to live with his family at the Leiden Southern Station. Several long visits to Leiden were made in order to give his lectures and to do optical experiments. Together with his wife Johanna, who was his close collaborator all his life and who made most of the special optics needed in the various spectrophotometric instruments, Walraven used the Lightcollector and its 5-channel photometer for impressive studies of OB stars, cepheids and the brightest stars in both Magellanic Clouds. He set an example on how to use a photometric system, in this case his own VBLUW system, for the determination of the physical parameters of stars: effective temperature, surface gravity (luminosity), metal abundance and the required interstellar reddening corrections

Walraven's long stays at the Leiden Southern Station, however, also led to an increased isolation from his colleagues and students in Leiden. Much of his work therefore remained unpublished and circulated only through a few conference proceedings and drafts. In the end his scientific impact was not as profound as he had certainly deserved.

In the early sixties the Walravens left the Leiden Southern Station to go to the Mount Stromlo Observatory (then led by Bart Bok), but they returned to Leiden after only one year. After that Walraven didn't use his 5-channel photometer any more but until his retirement he concentrated on developing new, more ambitious spectrophotometric instruments.

Even though Walraven formally had few students, he had a profound influence on several Leiden-bred astronomers who applied his teachings on instrumentation and observational astronomy in their own work, like Dr. J. Tinbergen, who became a well-known polarimetrist and Prof. Dr. J. W. Pel, who - at Walraven's instigation- first became a specialist on cepheids and later became a succesful leader in optical astronomical instrumentation in the Netherlands.

In the late sixties, working in his small optical laboratory in the cellars of the old Leiden Observatory, Walraven developed a unique radial velocity photometer. Unfortunately the Dutch Science Foundation ZWO did not support further development of this instrument. A missed opportunity, as the subsequent development of this branch of astronomy has now shown. Walraven also pursued his development of ingeneous polarization optics, finally producing a 12-channel spectrum scanner, where the stellar spectrum was split into nearly rectangular bands that could be scanned and measured simultaneously by twelve photomultipliers. Unfortunately the powerful prototype was never developed into a general user instrument and its use remained limited to the rather few observations made by the Walravens after their final return to South-Africa in 1968.

After Fjeda's retirement Fjeda and Jo Walraven moved in 1981 to the small town of Cornelia, in the Orange Free State, where they built their own fully automated 40-cm telescope, and used a further development of the scanner to continue observations of multiperiodic variable stars. During his last visit to Leiden in 1990 Fjeda brought with him beautiful multicolour observations of AI Velorum, but after his beloved Jo had died the previous year he had stopped observing.

The conditions for observations at Hartebeespoort had meanwhile much deteriorated and the scientific programs at the Leiden Observatory became much more focused on ESO. Even so in the seventies extensive programs were done on the southern cepheids, RR Lyrae, X-ray binaries and the Magellanic Clouds by Pel, Lub and van Genderen. In 1978/79 the Walraven photometer and Lightcollector telescope were therefore moved to ESO in Chile to start a new and very productive new life on La Silla. Among the most important programs we mention only the preparatory work for the Hipparcos input catalogue. After 32 years of operation the photometer was finally decommissioned in 1991. It is now on show at the Boerhaave Museum of the history of Science in Leiden, as a tribute to a great instrumentalist.

Fjeda Walraven's death leaves those whom he taught and those whom he collaborated with and inspired with the sad feeling of losing a brilliant instructor and a great role model in observational astronomy.

Jan Lub
Rudolf S. Le Poole

2. Foreword

Dear Reader,

This annual report describes the activities of the Sterrewacht Leiden in 2008. Once again, we have had a succesful and exciting year, full of academic achievements by students and staff. I believe it would have made a nice 200th birthday present for Frederick Kaiser (1808-1872) – director of the Sterrewacht from 1837 to 1872 and responsible for the construction of 'the' sterrewacht building on the Witte Singel.

2009 is the International Year of Astronomy, to commemorate the fact that 400 years ago Galileo was the first to turn a telescope to the heavens and record his discoveries. But in the Netherlands 2008 was also worth celebrating: it marked the 400th anniversary of the (unsuccessful) application to patent the telescope, by the Dutch optician Lippershey. In September the Sterrewacht organized a week-long international conference “400 years of astronomical telescopes” in Noordwijk, which brought together historians and astronomers and provided a fascinating review of the developments from the time of Lippershey to the present and beyond. The conference also provided a unique photo-opportunity: five of ESO's seven past and present directors-general were among the attendants: four Dutch DGs, and one Nobel laureate. You can find the picture elsewhere in this book. The anniversary also sparked a beautiful exhibition at the Boerhave Museum. In June the museum was also the site for a symposium to celebrate Kaiser's 200th anniversary.

European astronomy is in the enviable position to be waiting for quite a few new front-line observing facilities, and we are working hard to be ready for them. I am therefore very happy with a

number of new developments. In November NWO decided to support the Dutch node of the European ALMA Regional Support Center. This effort was started up by NOVA, but can now be fleshed out and made more structural with this NWO funding. The group will be hosted by the Sterrewacht. In December NOVA won a 18.8 million euro grant for the development of optical/infrared instrumentation for the European Extremely Large Telescope, ESO's next flagship project. This 10-year grant will allow us to plan into the future, and it is a crucial step towards major Dutch involvement in the ELT project. Leiden astronomers participate heavily in the on-going instrument concept studies that are underway. In Drenthe the new radio telescope LOFAR is taking shape, and this continues to generate much scientific activity in anticipation of the first data: in Leiden we are particularly focusing on the 'middle-ware' between the correlator output and the scientific data, and on the low-frequency sky surveys that LOFAR will conduct. And last but not least, 2009 should see the launch of the Herschel observatory, a giant mid-infrared telescope developed by ESA. A large group of Sterrewachters went and visited the Herschel observatory as it was undergoing final testing in ESTEC. Many of us are involved in the Herschel observing programme, and are now eagerly awaiting the start of observations.

On the scientific staff we have three newcomers. Jarle Brinchmann and Henk Hoekstra joined us during 2008 as tenure-track assistant professors. Jarle moved to Leiden from Porto, and fills a long-standing vacancy. He is an expert in galactic structure, particularly using the Sloan Survey. He also has extensive experience in instrument-related projects, and serves on ESA's Astronomy Working Group. Henk's appointment was possible thanks to an overlap appointment funded by NOVA, in anticipation of several retirements in the coming years. Previously he was assistant

professor at the university of Victoria in Canada. He is an expert in gravitational lensing and cosmology, and is heavily involved in the current set of wide-field imaging surveys that are mapping the dark matter distribution in the universe.

Mike Garrett joined the Sterrewacht as an adjunct professor. Mike is a radio astronomer and has been director of ASTRON in Dwingeloo, the institute that is building LOFAR, since 2007. He will teach a course on radio interferometry. In some sense he succeeds Richard Schilizzi, whose appointment came to an end coinciding with his move to Manchester as director of the SKA project. Together with Thijs de Graauw, who became director of the ALMA project in Chile, and Tim de Zeeuw at ESO, Leiden (ex-) professors are now in charge of four of the world's major observing facilities!

On January 13, 2008, Fjeda Walraven passed away in South Africa, where he had settled many years ago. Fjeda was a lector (senior lecturer) at the Sterrewacht, and his famous now-retired photometer is one of many astronomical pieces on exhibit in the Boerhave Museum of the history of science in Leiden. An obituary for him is included in this annual report.

Two Sterrewachters reached retirement age in 2008: George Miley, who has been a very visible and important part of the scientific life of the observatory for over 30 years, including a period of 7 years as scientific director (1996-2003) before becoming one of the first KNAW professors, and Jet Katgert who has supported Dutch astronomy in many important ways over the years, including long periods as secretary of the ASTRON board and editor for the journal *Astronomy and Astrophysics*. She is also the author of a very comprehensive book recording the manuscripts and

correspondence of Jan Oort. I am pleased to report that neither George nor Jet show any signs of slowing down or leaving.

Christine Gündisch left the Sterrewacht after two years of ably assisting Jan Lub as assistant institute manager: she now works at the Museon in the Hague.

Once again the Sterrewacht had a large number of visitors. The 2008 Oort professor was Simon White (Max Planck Institute for Astrophysics), and it was a pleasure to host him and his many visitors. This year's Sackler lecture was given by Didier Queloz (Geneva). HongSheng Zhao (St. Andrews) arrived in September to spend a sabbatical with us. In September Leiden was the home base for a group of European science writers who spent a busy week seeing most of what there is to see in Dutch astronomy.

Finally, 2008 was also a 'prize-winning year' for the Sterrewacht. After winning the Kok jury prize as the faculty's discoverer of the year 2007, Mariska Kriek (PhD 2007) won the Huygens prize, which is awarded once every five years to a young researcher in space sciences in the Netherlands. Minister Plasterk personally handed her the prize in Voorburg in November. Ivo Labbé (PhD 2004) was the recipient of the first Van Marum prize, awarded by the Koninklijke Hollandse Maatschappij in Haarlem, one of the country's oldest physics societies. Ewine van Dishoeck was inducted as a member of the American Association for Arts and Sciences. Marijn Franx and Henk Hoekstra won important research grants, an Advanced ERC grant and a VIDI grant respectively, and the university was awarded several million euro from the culture ministry for a much-needed restoration of the old observatory building. Once the building is restored the plan is to start to use it again in the astronomy curriculum. And for their discovery of an exoplanet Ignas Snellen and BSc students Meta de Hoon, Frances

Vuistje and Remco van der Burg won the popular vote in the Faculty's 2008 discovery of the year competition.

And so life at the Sterrewacht goes on. 2009 will be challenging, both scientifically but also organisationally. University funding is changing as a result of external pressures. There is more and more emphasis on temporary, project-based funding, threatening the structural long-term funding that is needed as the basis of a healthy scientific institute. Keeping up our success in funding applications is therefore vital. A number of retirements on the scientific staff are on the horizon, and finding excellent replacements is always a challenge. Finding and housing a growing number of graduate students is a significant but worthwhile effort, and puts pressure on office space. But in spite of such short-term worries, I firmly believe that with the current complement of faculty, postdocs, students and support staff we are in an excellent position to continue to do justice to the rich tradition of our institute.

Koen Kuijken
February 2009



Four Dutchmen and a Nobel Prize. Five ESO DG's, past and present, taken at the Noordwijk conference in September 2008: Harry van der Laan, Lo Woltjer, Adriaan Blaauw, Tim de Zeeuw and Ricardo Giacconi (in the middle). Only ESO's first and sixth DGs, Otto Heckmann (deceased) and Catherine Cesarsky, were missing.

3 A tribute to Jet Katgert on her 65th birthday

Jet Merkelijn was born in 1943 in the middle of the second world war. Her birth was at her grandparents' house in the Hague, while her father had gone into hiding to avoid being drafted to Berlin as a doctor. After the war her father specialized in gynaecology and moved to Vlissingen in the province of Zeeland. Her parents were Dutch Calvinists ("gereformeerd"). Her faith has been important for Jet throughout her life and it never affected her interest in science. Jet attended school at the Middelburg Gymnasium, matriculated in 1960 and decided to study astronomy at Leiden. This decision was a well-considered choice.

She did well at university and served as an apprentice student to Gart Westerhout, famed for his large radio surveys of the Milky Way at 21 cm. After completing her "candidaats" examination in 1963 (roughly equivalent to a B.Sc.), she did a minor research project with R. Steinitz (a visitor from Israel, who went on to do a PhD in the field of magnetic stars) and then completed an excellent major research project with Mike Davis, an American postgraduate student of Oort's.

In 1966 Jet was offered the opportunity of doing research in Australia with John Bolton, one of the most renowned pioneers of radio astronomy. She gladly accepted and participated actively in the seminal radio surveys of the southern sky that were then being carried out with the Parkes radio telescope, one of the largest in the world. Her main work concerned the survey of extragalactic radio sources at 2700 MHz (11 cm). After measuring the source positions, she identified several hundreds of sources with optical objects. The project was a great success. After returning to Leiden, she used these data to determine the luminosity function of radio sources at

400 and 2700 MHz and wrote a PhD thesis under the supervision of Oort. She was awarded a PhD in 1970.

After completing her PhD, she continued for a few years as a researcher at Leiden Observatory. This was the period when the new Westerbork Radiotelescope was being commissioned. Jet worked intensively with Peter Katgert and Rudolf Le Poole in testing the underground cables for leakages. Her collaboration with Peter resulted in more than just leak-free cables. At a meeting of the International Astronomical Union at Brighton in August 1970 I noticed Peter and Jet walking hand in hand, clearly in love with each other. The last article of Jeannette K. Merkelijn appeared in 1972. Thereafter she wrote under the name of J.K. Katgert-Merkelijn. In 1974 they left for Cambridge, England, where Peter had secured a fellowship at the Institute of Astronomy. They both managed to survive on the modest English stipend - no mean feat. In 1975 their roles were reversed, with Peter accompanying Jet to Bologna for a year's visit to the Istituto di Radioastronomia. They made many good friends there, learned to speak Italian and acquired a love of Italy and Italians that remains with them to this day.

In 1976 they returned to Leiden, when Peter was appointed as a permanent member of the Observatory staff. At Leiden Jet joined a collaboration that had been established between Leiden and the CfA at Harvard to carry out complementary radio observations of X-ray sources detected by the satellite. This project progressed with difficulty, partly because most of the newly detected X-ray sources did not emit strong radio emission. Meanwhile, Jet had become secretary of the Observatory Council, a structure that had been initiated following the wave of democratic reforms in 1968.

In 1980 the Netherlands Organization for Scientific Research (NWO) set up a new organization, ASTRON, to serve branches of astronomy that were not dealt with by the radio astronomy institute at Dwingeloo (SRZM). Jet applied for the job of Executive Secretary of ASTRON and was appointed to this job by Adriaan Blaauw, the Chairman of ASTRON. The two worked well and effectively together. A few years later SRZM and ASTRON were fused by NWO into the present ASTRON organization and located at Dwingeloo.

Meanwhile Peter en Jet had produced two young sons and Jet took a few years off to look after them. In 1985 the whole family went to La Palma. Peter worked there for a year as part of our contribution to the new British-Netherlands Observatory there, with its large 4.2m William Herschel telescope. It was not a very happy time. After their return to Leiden Jet occupied the position of Executive Secretary of ASTRON once more in 1987 during a sabbatical of her successor, Wilfried Boland.

In 1988, on the initiative of Butler Burton, a plan was made to set up and catalogue Oort's archive for the benefit of future science historians. NWO agreed to fund this project and awarded Jet a two-year contract to carry it out. However, this work could not be fully completed within the allocated two years. After her contract ceased, Jet took up a position as an English school teacher and occupied this position from 1991 until 1994 (As hobby she had previously obtained an English MO-A teaching diploma). In 1994 the Oort fund decided to fund the completion of the archive work and from 1994 until 1996 Jet worked hard to organize the archive. She published the results in a highly praised and highly cited book, 'The manuscripts and correspondence of Jan Hendrik Oort'.

In 1996, when Jet completed her work on the Oort archive, I had become one of the chief editors of *Astronomy and Astrophysics*. The work as editor was considerable and relentless. My secretary, Bernarda Smit and I were scarcely managing to cope. Frank Israel suggested that I ask Jet if she would be willing to assist. I put the question to her after a concert given at her home. She immediately replied with the smallest number of words "Yes, please". When I subsequently asked André Maeder, Chairman of the A&A Board whether he would agree to her appointment, his answer was: "Isn't she the person who has written that beautiful book about Oort? Of course we must appoint her."

We immediately agreed a division of work. Jet would work as an independent editor, but would consult the Chief Editor before refusing a manuscript or when a dispute arose between author and referee. The following years were extremely enjoyable. The editorial office occupied a large room in the Huygens Laboratory. It was hard work to deal with the continuous stream of manuscripts that we received, with typically 3 new papers per working day. Bernarda Smit was our permanent secretary, helped by a temporary assistant (filled successively by Hedy Versteeg, Marijke Wisse and Elise Lindhout) and a large number of paid astronomy students (Arjen van der Meer, Fatima Samar, Mariska Kriek, Sebastiaan van der Laan, Alexander Verpoorte, and Maaïke Damen). The atmosphere was almost always pleasant. We worked hard but believed in the worth of what we were doing. There were funny moments and we received some peculiar telephone calls ("I am now walking with my son on the glacier, but assure you that I will send you my article shortly"). Jet and Bernarda delighted the Italian astronomers by dealing with them in Italian. There were seldom any conflicts. Probably that is the reason that I remember one hectic moment, when, after a tactless remark on my part, a furious Jet threw a whole tray of files into the waste paper box,

saying “Okay. That’s what I’ll do”. Fortunately, this was an isolated incident.

In 2002 I retired and the A&A office left the Netherlands. Jet continued for a year as language editor for A&A manuscripts, copiously checking their English. Afterwards she spent two years with the University library in a project to digitize Leiden PhD theses and make them available on the web. Thereafter she retired. Although Jet never had a permanent job and ceased doing research in astronomy in 1980, throughout her career she has contributed substantially to astronomy. Yet Jet is still working in the Observatory, doing odd jobs: as a sideline from the Oort archive work she set up a website with astronomical group photographs complete with as many identifications as possible (www.strw.leidenuniv.nl/~merkelyn), and recently she acted as associate editor for the proceedings on the conference on 400 years of astronomical telescopes.

My favourite memory of Jet until now is from our A&A period. It was a gray Dutch winter morning and it kept on pouring down with rain. Suddenly Jet appeared, covered by a cape and dripping with water. Her face shone triumphantly. “Here I am” she said. As I kept looking at her, I thought about “A man for all seasons”, the title of the well-known film about the English statesman Thomas More, who as Lord Chancellor stood up to Henry the Eighth. This recollection remains and frequently, when I think of Jet, I see the title, the triumphant image and dripping cape. Intelligent, dedicated, hard working, sincere loyal and reliable. Yes, a lady for all seasons of life.

Harm Habing; translation George Miley



Chapter 2

Research

Sterrewacht
Leiden

Research

Chapter 2

1. History and heritage

As part of the interdepartmental science history group effort, Baneke has started a description of and initiated a conservation program for the Leiden Observatory Archives. He finished the description of the papers of Willem de Sitter (1872-1934). The archives will be digitalized and preserved in collaboration with the Leiden University Library. The program is funded by the Gratama Fonds and 'Metamorfoze', the Dutch government program for the preservation of the national paper heritage.

2. Planetary Systems

2.1. The Solar System

The chemical composition of cometary ices

Hogerheijde, de Pater (UC Berkeley, USA), Blake (Caltech, USA), and six other collaborators completed the analysis of millimeter-wave interferometric observations of molecular line emission from the comet C/2002 T7 (LINEAR). Their observations were obtained simultaneously with two instruments, the Owens Valley Radio Observatory (OVRO) array and the Berkeley-Illinois-Maryland (BIMA) array in Hat Creek (both California), and subsequently combined. They detected emission from the molecules HCN and CH₃OH. This emission was well reproduced by a model in which both species evaporate off

the nucleus. They established rigorous error bars on the molecular production rate, taking into account uncertainties in the measurement, in the non-equilibrium excitation of the molecules, and of collision rates with water. In spite of the uncertainties, the production rates of HCN (0.1 per cent of that of water) are within the narrow range observed toward other comets while those of CH₃OH (0.7 per cent) are on the low end of the commonly observed range.

2.2. Extrasolar Planets

Discovery of sodium in an exoplanet atmosphere

Snellen, Albrecht, de Mooij and Le Poole obtained the very first detection of the atmosphere of the famous transiting exoplanet HD209458b from the ground! They re-analyzed archival Subaru data and found sodium in its transmission spectrum. The radial-velocity technique has revealed the existence of more than 200 extrasolar planets. This technique allows good determination of their orbits, but very little else. However, the case is very different when the orientation of a planet is such that it transits its host star, regularly blocking off a fraction of the star light. For these planets, the mass, radius, and average density can also be determined, and their atmospheres can be probed through secondary eclipse photometry and transmission spectroscopy.

Snellen also used the ESO Very Large Telescope to confirm the Leiden-student-planet. This planet turned to have a mass of 4.5 Jupiters, and it was the first exoplanet discovered around a hot and fast-rotating main sequence star.

No detection of GL86

Together with Lopez and Mather (both Nice, France) Jaffe reduced MIDI/AMBER data on the exo-planet GL86. Detection from this data is unlikely but the technical details have been submitted to SPIE. AMBER has been improved and the experiment will be retried in 2009.

2.3 Observing Protoplanetary Disks

Molecular gas in two planet-forming disks

Panič, Hogerheijde, Wilner, and Qi (both CfA Boston, USA), analysed millimeter-interferometric observations of molecular gas in the planet-forming disks around two young stars: the solar-type star IM Lup and the more luminous intermediate-mass star HD 169142. Both disks were clearly detected in emission of ¹²CO and ¹³CO. The emission seen around the latter source, HD 169142, could be explained with the knowledge of the disk structure that had

already been obtained from broadband flux density measurements. Because the brighter star keeps the disk's temperature above 20 K, CO does not freeze out (unlike the case of IM Lup, see below). However, the attempts by Panič et al. to reconcile the gas emission lines with the thermal dust continuum emission suggested that the disk around HD169142 is gas-poor, unless the dust particles emit very efficiently at millimeter wavelengths,

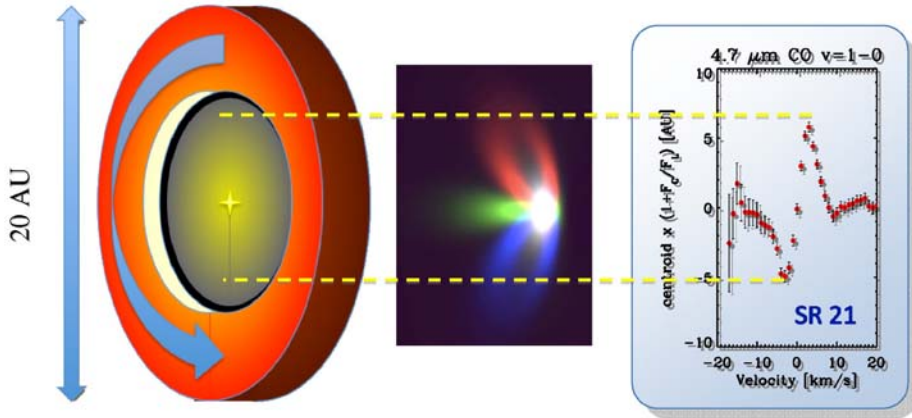


Figure 1: Illustration of the spectro-astrometry technique. Left: sketch of a protoplanetary disk with gas in Keplerian rotation seen at non-zero inclination. Middle: the velocity pattern of the rotating gas, with the blue- (bottom) and red- (top) shifted emission offset from the central star. Right: observed spectro-astrometry pattern for the source SR 21 with VLT-CRIRES, in which the location of the peak emission in each velocity bin is recorded. In high signal/noise data, this location can be determined much more accurately than the spatial resolution given by the slit and AO system. For SR 21, an accuracy better than 1 milliarcsec is reached (Based on an ESO press release in september 2008 by Pontoppidan and coworkers.).

Mind the gap: imaging of gas in protoplanetary disk gaps

Pontoppidan, Blake (both Caltech, USA), van Dishoeck, Brown (MPE, Garching, Germany) and collaborators presented the first velocity-resolved spectro-astrometric imaging of the 4.7 micron ro-vibrational lines of CO gas in protoplanetary disks, which they obtained with CRIRES on the VLT at a resolving power of 100 000. They imaged three disks with known dust gaps out to 45 AU and achieved an unprecedented spatial resolution of 0.1-0.5 AU, comparable to or better than that obtained in mid-infrared interferometry. Keplerian disk models fitted to the position-velocity curves provided geometrical parameters, including position angles and inclinations with

accuracies as good as one to two degrees. The detection of molecular gas well inside the dust gaps in all three disks supports a scenario in which the dust gap is caused by partial clearing by a massive planetary body (mass one to ten Jupiters) and ruled out other clearing mechanisms such as photo-evaporation. In one source (SR 21), the gas appeared to be truncated within about 7 AU, which may be caused by complete dynamical clearing by a more massive companion. The observations of TW Hya suggest the existence of a warp between the inner and outer disks. Significant azimuthal asymmetries were found in the other two inner disks.

Water and OH gas in the terrestrial planet-forming zones

Salyk, Pontoppidan and Blake (all Caltech, USA) worked with Lahuis, van Dishoeck and Evans (UTexas, USA) to detect numerous emission lines from hot water in the 10-20 micron range in Spitzer-IRS spectra of two protoplanetary disks around T Tauri stars. Follow-up 3-5 micron observations with NIRSPEC on the Keck Telescope confirmed the presence of abundant hot water and spectrally resolved the lines. Lines from OH, CO and ^{13}CO were also detected. Line shapes and LTE models suggested that the emission from all three molecules originates between radii of about 0.5 and 5 AU, and thus provided a new window for understanding the chemical environment during terrestrial planet formation. The high column densities of H_2O and OH suggest physical transport of volatile ices either vertically or radially in the disk.

2.4 Modelling Protoplanetary Disks

Coagulation of dust particles

Planet formation takes place in protoplanetary disks orbiting young stars as dust grains collide and grow to ever larger bodies. However, this process ceases to be efficient as the particles grow to sizes of a few decimeters, as such 'rocks' have very poor sticking properties. Johansen and Brauer, Dullemond, Klahr, and Henning (all Heidelberg, Germany) investigated a scenario in which the rocks grow in size by sweeping up small dust particles, rather than particles of the same size. Collisions between a large and a small body leads to sticking under a wide range of circumstances. By itself, the reservoir of small bodies is exhausted very quickly, but it can be replenished by grains resulting from destructive collisions between large bodies. In this scenario, a small fraction of rocks grow quickly in mass, at the expense of the ones that collide with one another and are thus destroyed. Modelling the two components, rocks and collisional fragments, Johansen found that the rocks indeed grow very efficiently, but that turbulent transport of solids away from the mid-plane of the disk strongly limits the growth.

Planet Formation in dead zones

Protoplanetary disks are probably turbulent because of magnetorotational instability. This instability renders Keplerian disks unstable to small perturbations in the presence of a weak magnetic field and leads to mass migration through the disk. However, parts of a protoplanetary disk have such a low ionisation fraction that the coupling with the magnetic field is too weak for magnetorotational instability to develop. Johansen, Lyra, Piskunov (both Uppsala, Sweden), and Klahr (Heidelberg, Germany) considered protoplanetary disks with a magnetically dead zone. The migration of gas in the active zones leads to a pile up of mass at the transition between active and dead zones. The transition region in turn develops massive vortices and these vortices are very efficient at concentrating rocks and boulders. The concentrations become so strong that local regions contract gravitationally and form planets inside the vortices, some of them more massive than Mars.

Debris disks and planet formation

Kospal, Ardila (Caltech, USA), Abraham, and Moor (Konkoly Observatory, Hungary) studied debris disks in relation to planet formation. In debris disks, dust is generated by collisions between planetesimals. The existence of these planetesimals is a consequence of the planet-formation process, but the relationship between these disks and planets is not yet clear. Kospal and her colleagues studied it by comparing the incidence of debris disks in stars with and without planets, using 24 and 70 micron observations with the Spitzer Space Telescope to look for the thermal emission from cold dust. They analyzed the largest such sample ever assembled consisting of 143 stars with planets revealed by radial velocity methods. They used survival analysis, allowing the use of non-detections as well, to compare the two samples. They found that there is a marginal difference between the two samples: planet-bearing stars have debris disks slightly more often than stars without planets. Analysing the correlation of the excess emission (the sign of debris dust) with the stellar parameters, it seemed that - similarly to the presence of planets - the incidence of debris disks is related to the stellar metallicity, supporting the common origin of planets and debris dust.

3. Star formation and circumstellar matter

3.1 Circumstellar gas

Ice survey of low-mass protostellar envelopes

Öberg, Boogert (IPAC, USA), Pontoppidan (Caltech, USA), van Dishoeck, Lahuis and the 'Cores to Disks' (c2d) IRS team continued their Spitzer Space Telescope plus ground-based 3-38 micron spectral survey of a sample of 41 low-luminosity young stellar objects (YSOs) down to proto-brown dwarfs. The third major paper in the series focussed on CH_4 which is proposed to be the starting point for making more complex organic molecules. Solid CH_4 abundances have previously been determined mostly toward high-mass star-forming regions. At least half of the sources show an absorption feature at 7.7 micron, attributed to the bending mode of solid CH_4 . The inferred solid $\text{CH}_4/\text{H}_2\text{O}$ abundance ratio is about 5 per cent. These abundances are consistent with models in which CH_4 is formed through sequential hydrogenation of atomic carbon grain surfaces. The fact that low-mass young stellar object have equal or higher abundances than high-mass objects, and correlation studies with other species support this formation pathway. They do not support the two competing theories: formation from CH_3OH , and formation in gas phase with subsequent freeze-out.

Small-scale organic chemistry in the protobinary IRAS 16293 -2422

Bisschop, Jørgensen (Bonn, Germany), Bottinelli, and van Dishoeck investigated the chemical relations between complex organic molecules in the low-mass protobinary YSO IRAS 16293-2422 (Fig. 2) using the SubMillimeter Array (SMA) at 5 arcsec angular resolution (corresponding to a linear resolution of 800×500 AU). For HNCO and CH_3CN the compact emission arises mostly from source A, whereas CH_2CO and $\text{C}_2\text{H}_5\text{OH}$ have comparable strength, and CH_3CHO is seen exclusively from source B. The relative abundances are very similar to those found in high-mass YSOs illustrating that the chemistry appears to be independent of luminosity and cloud mass. In contrast, larger abundance differences are seen between the sources A and B which may be linked to different initial ice abundances, with OCN -ice more abundant toward A. Successive hydrogenation on surfaces is not sufficient to explain the measurements of CH_3CHO . The data illustrate the greater importance of interferometric with respect to single dish data to test chemical models.

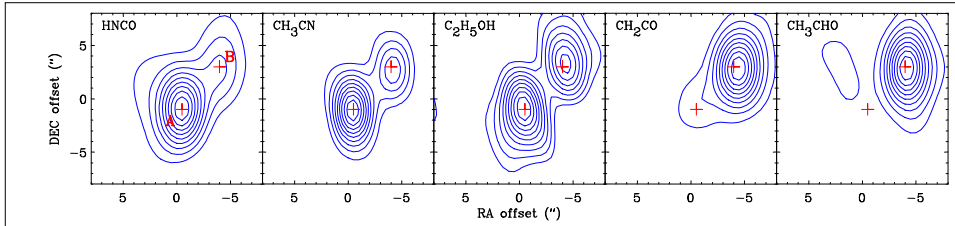


Figure 2: Interferometric line images of the low-mass protobinary object IRAS 16293 -2422 obtained with the SubMillimeter Array. Different distributions of the oxygen and nitrogen-bearing complex organic molecules are seen, even though the two sources are separated by only 800 AU (from: Bisschop et al.).

Lack of PAH emission toward low-mass embedded YSOs

Polycyclic aromatic hydrocarbons (PAHs) have been detected in molecular clouds and some young stars with disks, but not yet in embedded YSOs. Geers, van Dishoeck, Pontoppidan (Caltech, USA), Lahuis and co-workers combined high-sensitivity observations with ISAAC on the ESO Very Large Telescope (VLT) and with the IRS on the Spitzer Space Telescope and searched for the 3.3, 7.7 and 11.3 micron bands of PAHs in a sample of 53 embedded YSOs. No detections were obtained. They combined radiative-transfer codes from Dullemond (Heidelberg, Germany) with a PAH-excitation module from Visser and studied the sensitivity of the PAH emission to its abundance, the stellar radiation field, the inclination of and the extinction by the surrounding envelope. Under the assumption of typical stellar and envelope parameters, the absence of PAH emission is best explained by the absence of emitting carrier. This implies a PAH abundance at least an order of magnitude lower than in molecular clouds but similar to that found in disks. Thus, most PAHs probably enter protoplanetary disks frozen out in icy layers on dust grains, in coagulated form, or both.

Modeling water emission from low-mass protostellar envelopes

Water vapor plays a key role in the chemistry and energy balance of star-forming regions. Van Kempen, van Dishoeck, Hogerheijde, Doty (Denison Univ, USA) and Jørgensen (Bonn, Germany) simulated the emission of rotational water lines from low-mass YSO envelopes in preparation for observations with the Herschel Space Observatory. A large number of parameters influencing water line emission have been explored: luminosity, density, density slope, and water abundances. The results show that lines can be categorized in: (i) optically thick lines, including ground-state lines, mostly sensitive to the cold outer envelope; (ii) highly excited (upper level energy 200 - 250 K) optically thin lines sensitive to the water abundance in the hot inner part;

and (iii) lines which vary from optically thick to thin depending on the abundances. A correct treatment of the dust in the water excitation and line formation is essential. Observations of H_2^{18}O lines, although weak, provide the strongest constraints on abundances.

3.2. Embedded young stellar objects (YSOs)

Characterizing the nature of embedded YSOs

Crapsi, van Dishoeck, Hogerheijde, Pontoppidan (Caltech, USA) and Dullemond (Heidelberg, Germany) used 3-D axisymmetric radiative transfer calculations of YSO models including envelope, disk and outflow cavity to show the effects of different geometries on the main indicators of YSO evolutionary stages. For systems viewed at intermediate angles (inclination between 25 and 70 degrees), all indicators (infrared colors, bolometric temperature and the optical depth of silicate and ice features) are found to accurately trace envelope column density, and all agree with each other. On the other hand, edge-on systems are misclassified for inclinations larger than 65 degrees. In particular, silicate emission, typical of pre-main sequence stars with disks, turns into silicate absorption when the disk column density along the line of sight reaches 10^{22} cm^{-2} ; similarly confusing effects are noticed in all other indicators. Such misclassification has a large impact on conclusions regarding the nature of the observed flat-spectrum infrared sources whose numbers can now be explained by simple geometrical arguments without invoking evolution. The simplest and most reliable classification scheme consists of comparing submillimeter fluxes obtained with a single dish and an interferometer.

Protoplanetary disks and stars in the embedded phase

Lommen, Jørgensen (Bonn, Germany), van Dishoeck and Crapsi used the SMA to study disks in the embedded Class I stage taking as examples the two sources IRS 63 and Elias 29 in Ophiuchus. In combination with single-dish data, the interferometer measurements yielded ratios of envelope to disk mass of 0.2 and 6, respectively, for the two objects. This is lower than the ratios in excess of ten found for Class 0 sources, suggesting that this ratio is a tracer of the evolutionary stage of a YSO. $\text{HCO}^+ \text{ J} = 3-2$ was detected toward both sources, with position-velocity diagrams indicative of Keplerian rotation. For a fiducial inclination of 30 degrees, stellar masses are 0.4 and $2.5 M_{\text{Sun}}$, which indicates that most of the stellar mass has been assembled before the Class I stage.

The disk around IM Lup offers a stark contrast: out to 400 AU the CO gas emission was easily explained by previous knowledge of the disk's structure, although significant CO depletion needed to be taken into account in this colder

disk around this fainter star. They found little evidence for dust beyond a distance of 400 AU from the star, even though the CO emission clearly extends to radii of 900 AU. Panič hypothesizes that radial dust migration has depleted the outer disk of its grains, with significant amounts of (perhaps mostly atomic) gas remaining.

Protostellar growth charts

Brinch and Hogerheijde, together with van Weeren and Richling (Paris, France), finished two theoretical studies on the evolution of molecular-line emission originating from protostellar cores during their collapse and subsequent formation of a disk. The first study showed that observations of millimeter-wavelength emission lines of a variety of species (CO, HCO⁺, HCN, ¹³CO, H₁₃CO⁺, ...) on a range of spatial scales (varying from 20 arcsec or 3000 AU attainable with single-dish telescopes down to a few arcsec or 300 AU, obtained with interferometers) can be used to uniquely characterize the dynamics of the material, as in transitions from infall-dominated to rotation-dominated: a protostellar growth chart. The second study showed that chemical processes such as freeze-out of CO onto dust grains does not seriously limit the applicability of these growth charts. This modeling involved a novel method to follow the time dependent nature of the chemistry in the evolving core, and in a separate study van Weeren, Brinch and Hogerheijde showed how this method can be applied also to model the full gas-phase chemistry.

4. Stars

4.1. Observing the stars

Caught! A flare from the classical T Tauri star DQ Tau

Salter, Hogerheijde, and Blake (Caltech, USA) serendipitously detected a flare of the classical T Tauri star DQ Tau at a wavelength of 3 mm. Over the course of just a few hours, the star brightened by at least a factor 27, followed by a decay over another eight hours (see Figure 3). Subsequent literature study revealed that DQ Tau is an eccentric close binary with a 15-day orbit. The flare coincided within the accuracy of the orbital parameters to the periastron passage of the stars, when the respective magnetospheres overlap. Salter, Hogerheijde and Blake put forward the hypothesis that the magnetic interaction accelerates electrons to relativistic speeds and so creates a sudden burst of synchrotron emission. Follow-up observations on December 28, 2008 showed that the flare very likely repeats every periastron passage. During such a flare, DQ Tau may easily outshine at 3 mm wavelength every other T Tauri in the Taurus star-forming cloud.

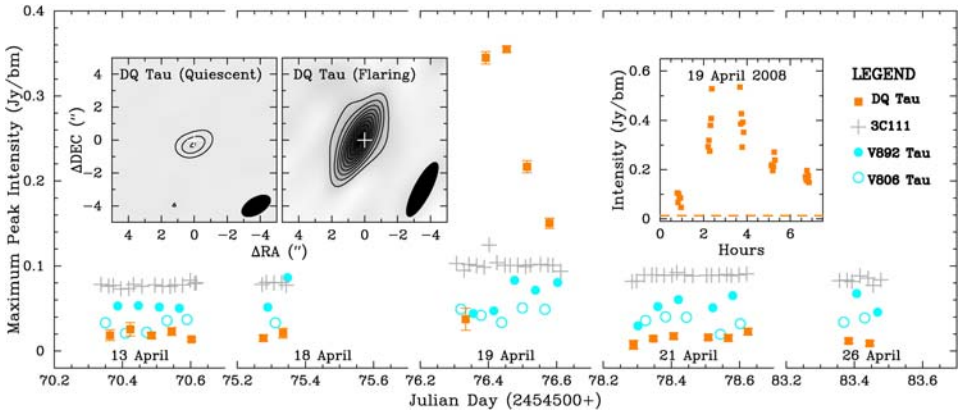


Figure 3: The flux of DQ Tau vs time on April 19, 2008. For comparison, the fluxes of other sources and calibrators observed at the same time with the same instrument are also shown. DQ Tau brightens by at least a factor 27 over just a few hours. Salter et al. suggest that the overlapping magnetospheres of this eccentric close binary cause the remarkable brightening. Follow-up observations revealed that this flare repeats every 15 days near periastron passage of the system.

The infrared excess around lambda Bootis stars

Martinez-Galarza, Kamp (Groningen, NL) and four other colleagues presented a model for stellar infrared excesses caused by the heating of dust by a hot star passing through a diffuse interstellar cloud. They applied the model to six lambda Boötis stars with infrared excesses. These are stars of type A to F with large underabundances of Fe-peak elements. Their results were consistent with the hypothesis that lambda Boötis stars owe their specific characteristics to interaction with the ISM. Martinez-Galarza and colleagues invoke radiation pressure from the star to repel the ISM dust, causing it to excavate a paraboloidal dust cavity in the interstellar cloud, while the metal-poor gas is accreted onto the stellar photosphere. Alternatively, the infrared excesses can also be fit by planetary debris disk models. A more detailed consideration of the conditions to produce lambda Boötis characteristics suggests that the majority of infrared-excess stars within the Local Bubble have debris disks. Nevertheless, Martinez-Galarza et al. expect the moving-star model to be applicable to most of the more distant lambda Boötis stars.

4.2. Modelling binary stars

Binaries in young stellar clusters

Together with Kouwenhoven, Goodwin (Sheffield, UK), Kaper, and Portegies Zwart (both Amsterdam, NL), Brown studied several modeling methods

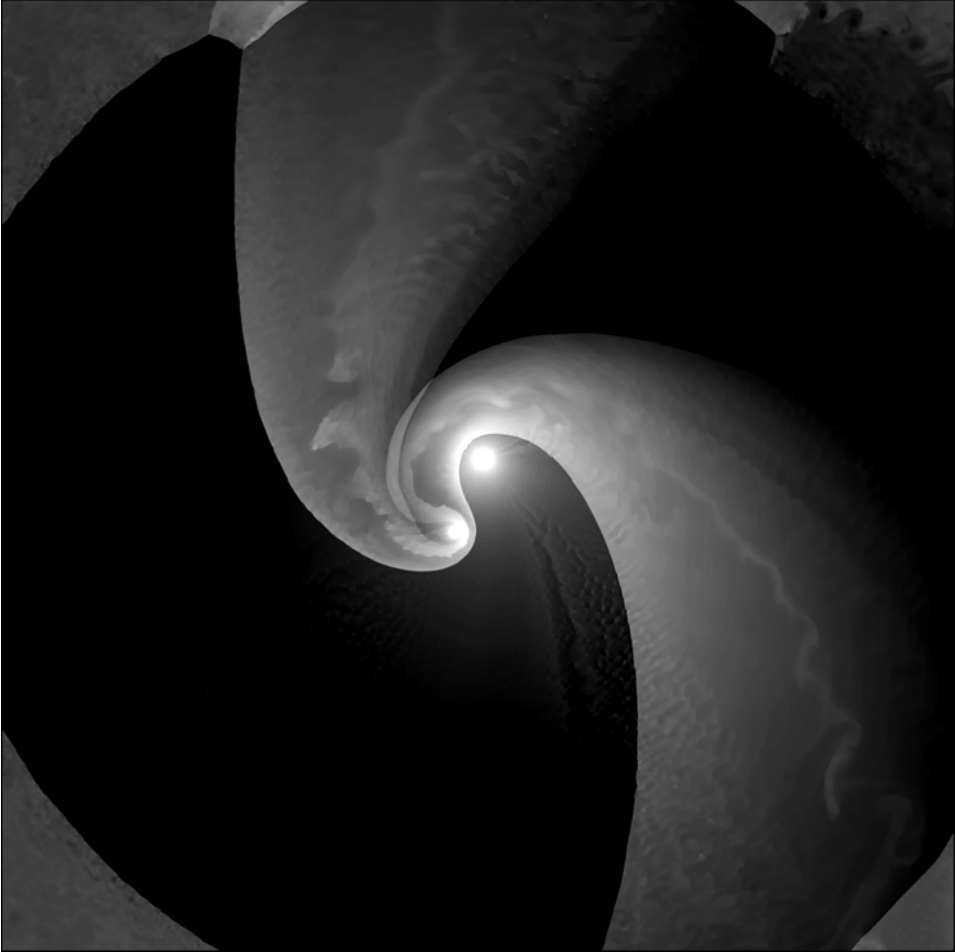


Figure 4: Logarithm of the gas density in the equatorial plane of a massive binary with eccentricity 0.8 and mass ratio 1:3, shortly after periastron passage.

commonly used to pair individual stars into binary systems (so-called pairing functions). These pairing functions are frequently used by observers and computational astronomers, either for their mathematical convenience, or because they roughly describe the expected outcome of the star forming process. The group studied the consequences of each pairing function for the interpretation of observations and numerical simulations. They found that the observed binary fraction and mass ratio distribution in general depend strongly on the range in primary spectral type used to select a sample. The mass ratio

distribution and binary fraction derived from a binarity survey among a mass-limited sample of targets is therefore not representative for the population as a whole. They also concluded that neither theory nor observations indicate that random pairing of binary components from the mass distribution, the simplest pairing function, is realistic.

Binary star misalignment

Albrecht conducted a study of the spin-orbital alignment in two binary star systems using the Rossiter-McLaughlin effect, a technique also used for transiting extrasolar planets. He found that in one double star system, DI Herc, the orbital plane and the spin-axis are strongly misaligned, and thus solved the twenty-year old mystery of the slow apsidal motion of this binary star system.

Colliding stellar winds in very eccentric binaries

In preparation for the Eta Carinae Project, Icke computed a survey of flow patterns in highly eccentric binary stars in the case that both binaries lose gas through a strong and dense stellar wind. The flow patterns turned out to be relatively simple: near apastron, the interface between the stars builds up to an almost stationary shock-contact-shock layer, while during periastron passage the stars smash through that layer, creating a characteristic 'yin-yang' double shock pattern (see Figure 4). The free-free radiation computed from the shock layers reproduces the typical asymmetric-peak shape seen in the X-ray light curve of Eta Carinae.

4.3. Compact objects

Oscillations make no waves in neutron stars

Levin and Berkhout worked on the theory of Quasi-periodic oscillations (QPOs) during type-I X-ray bursts, the thermonuclear explosions on the surfaces of accreting neutron stars. One currently popular theory associates these QPOs with the giant waves in the neutron-star ocean. However, Berkhout and Levin have found errors in the theoretical QPO literature and as a consequence have pointed out serious theoretical problems with the ocean-wave interpretation of the QPOs. Levin and van Hoven worked out the theory of hydromagnetic waves in the neutron star interior. They have applied this theory to the interpretation of QPOs in magnetar flares, and also to the analysis of stability of precessing neutron stars.

Dynamics of strongly magnetised black hole accretion disks

Johansen and Levin investigated the properties of strongly magnetized accretion disks around black holes. The strong magnetisation of such disks cause new

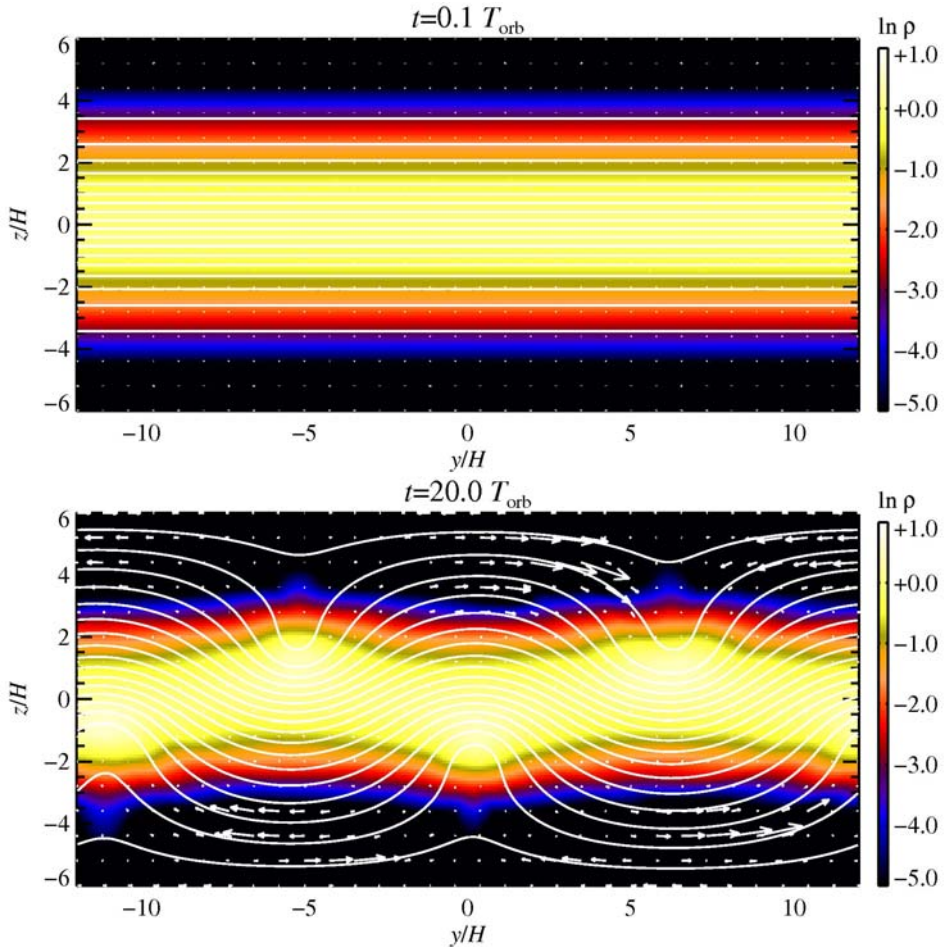


Figure 5: Evolution of the Parker instability in a strongly magnetised disk. Overlaid on the density are magnetic field streamlines (white lines) and velocity field vectors (white arrows). The initial stratification (first panel) is unstable to magnetic buoyancy, and magnetic field arcs begin to rise from the midplane. The arcs merge to form longer arcs, and eventually the system settles down into a new equilibrium state with two superarcs and four dense pockets of matter in the midplane (second panel).

dynamical phenomena not seen in their weakly magnetised counterparts. Strong magnetic field confinement is not stable and huge arcs easily arise by the action of the Parker instability (see Figure 5). These arcs in turn are subject to magnetorotational instability, which occurs in differentially rotating systems such as accretion disks. This causes disk gas to become turbulent and to transport

angular momentum very efficiently. Angular momentum transport is important because it leads to mass accretion through the disk, feeding the black hole. Contrary to previous beliefs, the magnetic field does not escape completely from the disk, but is replenished by the tangling of field lines in the turbulent gas.

Noise in gravitational wave interferometers

Levin developed a new method to calculate thermo-refractive noise in ground-based gravitational wave interferometers. This method is suitable for treating realistic optical configurations and inhomogeneity of the refractive medium.

5. Nearby galaxies

5.1. The Milky Way

Bulge dynamics: studying the nearest galactic bar

Kuijken, Soto and Rich (Los Angeles, USA) constructed a model of the stellar kinematics in the Milky Way bulge and bar. It was based on new measurements of proper motions and radial velocities with the Hubble Space Telescope (HST) and the ground based ESO Very Large Telescope (VLT), respectively. The VLT observations use an integral field unit (IFU) to take spectra of very crowded star fields in the bulge, from which stellar spectra are then extracted using the precise position information that is measured on the HST images. Repeat HST images separated by 3-5 years allowed accurate proper motions (equivalent to 30 km/s accuracy at the distance of the bulge) to be measured. The separate analysis of a data set of K-giants revealed a significant vertex deviation in the metal-rich stars, a clear signature of bar-like kinematics. Zeballos and Astramaadja used their research projects to make proper motion measurements from HST data for three new fields, at galactic longitudes between 5 and 10 degrees.

Stellar dynamics around black holes

Hopman's research focused on stellar dynamical phenomena in the vicinity of massive black holes, concentrating on a detailed study of many aspects of dynamics of binaries near massive black holes, the results of which are forthcoming.

Hopman and Toonen (now at Nijmegen) calculated the contribution of fly-bys of stars near massive black holes to the stochastic gravitational wave background was calculated. They showed that this background will not be a problem for the planned Laser Interferometer Space Antenna (LISA). Hopman analyzed

numerical models of the rate at which stars spiral into massive black holes. This yielded a simple expression for the dependence of the expected LISA event rate on the massive black hole mass.

Hopman and Alexander (Weizmann Inst., Israel) studied mass segregation near massive black holes. They concluded to the possibility of "strong mass segregation": this is a segregation of massive and light stars much more pronounced than considered possible by the classical 1977 paper by Bahcall and Wolf. Together with Keshet (first Princeton, now Harvard, USA) they studied, for the first time, mass-segregation for continuous mass functions and presented a comprehensive analytical description.

Hopman, Madigan, and Levin discovered a new instability of eccentric stellar disks around massive black holes. The nature of this instability is such that it can drive eccentricities of stars to very high values, and it may have implications for understanding the still unknown origin of the young stars in the Galactic center.

Dark matter distribution

Weijmans, with de Zeeuw, van den Bosch, Cappellari (Oxford), Kuntschner (ESO) and van de Ven (Princeton) extracted stellar velocity profiles and line strengths at 3 - 4 half-light or effective radii (R_e), in two early-type galaxies (NGC 3379 and NGC 821). She developed a new technique to obtain spectra of these faint outskirts of galaxies, using the SAURON integral-field unit as a 'photon-collector'. This way, she was able to double the radial extent over which stellar kinematics and line-strengths were available in these galaxies. Analysis of the line strengths showed that the stellar halo population is old and metal-poor, and that the line strength gradients observed in the inner parts ($< 1 R_e$) of these galaxies, continue out to at least $4 R_e$. By constructing triaxial Schwarzschild models she determined the dark matter content of these systems, showing that even in the central parts dark matter is present.

Ciotti and L. Morganti (both Bologna) and de Zeeuw worked out the dynamical properties of two-component spherical galaxy models with a $1/r^2$ distribution of the dark matter and realistic luminosity profiles.

5.2. The Local Group

Dust in the Small Magellanic Cloud Tail

A large team, led by Gordon (Space Telescope Science Institute, Baltimore, US) and including Israel, is using Spitzer Space Observatory data to study the dust

properties of the Magellanic Clouds. The Tail region of the Small Magellanic Cloud (SMC) was imaged using the MIPS instrument as part of the SAGE-SMC Spitzer Legacy. Diffuse infrared emission from dust was detected in all the MIPS bands. The Tail gas-to-dust ratio was measured to be about 1200 using the MIPS observations combined with existing IRAS and HI observations. This gas-to-dust ratio is higher than the expected 500-800 from the known Tail metallicity indicating possible destruction of dust grains. Two cluster regions in the Tail were resolved into multiple sources in the MIPS observations. Their local gas-to-dust ratios of about 440 and 250, respectively, suggest that in these regions dust formation occurs, or that they contain significant amounts of ionized gas, or both. The results support the notion that the SMC Tail is a tidal tail recently stripped from the SMC that includes gas, dust, and young stars.

5.3. Detailed studies

Zooming in on Centaurus A, the nearest AGN

Studying the strong radio source Centaurus A, hosted by the peculiar elliptical galaxy NGC 5128, Israel, Raban, Booth (Onsala, Sweden) and Rantakyrö (ESO) have determined the high-frequency (centimeter and millimeter wavelength) continuum spectrum of the very extended – eight degrees on the sky – radio source. From the maps obtained with the WMAP satellite for cosmological purposes, they extracted flux densities pertaining to the object. They found that the spatially integrated Cen A spectrum becomes somewhat steeper at frequencies above 5 GHz, where the spectral index changes from -0.70 to -0.82. Between 1989 and 2005, both the SEST in Chile and the JCMT in Hawaii were used to obtain millimeter line spectra to measure various molecules in absorption against the compact nucleus of Centaurus A. Israel and coworkers used these spectra to extract the continuum emission from the active galaxy nucleus at frequencies between 86 GHz (3.5 mm) and 345 GHz (0.85 mm) as a function of time. In the period covered by the measurements, the millimeter emission from the core of Centaurus A was clearly variable. They found that the variability correlates appreciably better with the 20 - 200 keV than the 2 - 10 keV X-ray variability. In its quiescent state, the core radio spectral index is -0.3, but it steepens when the core brightens. The variability appears to be mostly associated with the inner nuclear jet components that have been detected in VLBI measurements. The densest innermost nuclear components are optically thick below 45 - 80 GHz.

A team led by Espada (CfA Harvard, USA) and including Israel used the Smithsonian Millimeter Array (SMA) in Hawaii to obtain high resolution images of the $^{12}\text{CO}(-1)$ emission in the center of NGC 5128. For the first time, the team

could study at high resolution the distribution and kinematics of the molecular gas in the circumnuclear region. The molecular gas distribution is elongated in a position angle of 155 deg, perpendicular to the jet seen in radio and X-ray emission.

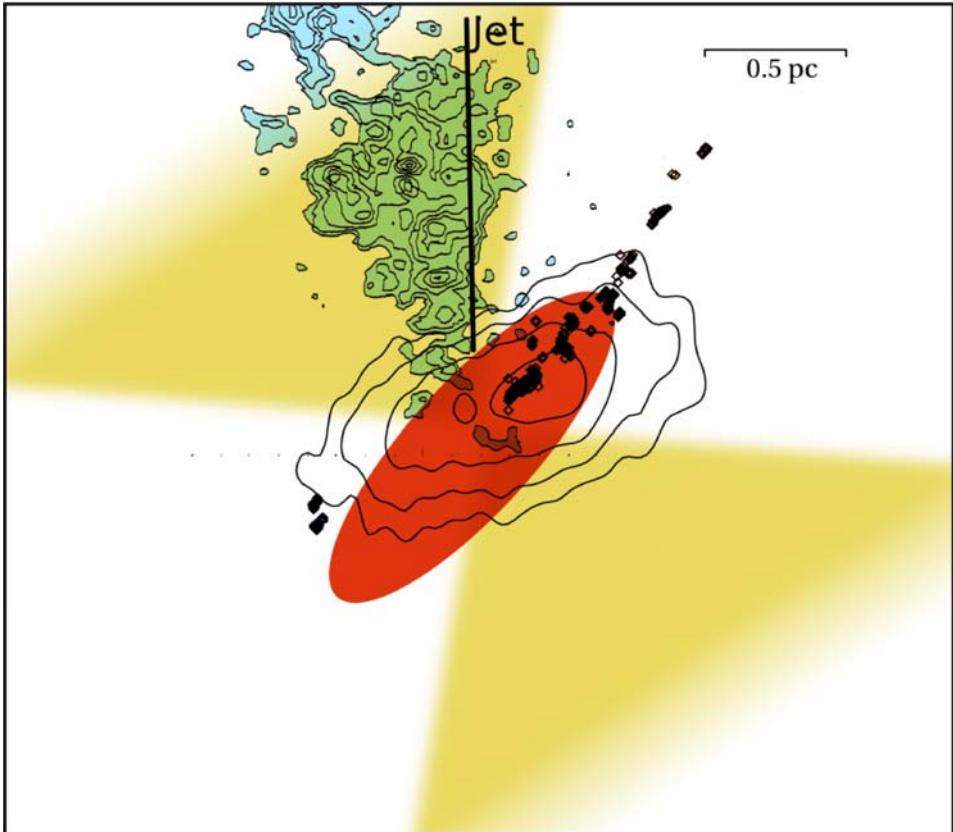


Figure 6.

A sketch of the parsec scale structures near the nucleus of the nearby Seyfert 2 galaxy NGC 1068. Red: the size and orientation of the warm dust disk mapped by the MIDI midIR interferometer. Contours: 5 GHz free-free radio emission from hot gas. Black spots: H₂O maser emission. The green and blue larger contours indicate the orientation of the "large scale" [OIII] emission seen by HST (but reduced in size here by a factor of 100), and the yellow "sand dial" a similarly reduced sketch of the expected extent of the ionization cone. From "Resolving the obscuring torus in NGC 1068" by Raban, Jaffe, Rottgering, Meisenheimer, Tristram 2009, MNRAS in press.

The molecular gas traced by CO coincides with the previously observed dust continuum, as well as ionized gas and pure rotational H₂ lines. Spatial and

kinematical asymmetries are apparent in both the circumnuclear and outer gas. Adopting a warped disk model, the team confirmed the existence of a gap in emission between the radii $r = 200 - 800$ pc ($12'' - 50''$) and explored the possible contribution of a weak bi-symmetric potential which could explain the anomalies.

IR interferometry of galactic nuclei

Jaffe, Raban, Röttgering, and colleagues at the Max Planck Institutes in Heidelberg and Bonn (Germany), and the NRAO (Charlottesville, USA) and Bonn and NRAO continued their work on mid-infrared interferometric observations of active galactic nuclei (AGNs) with the ESO-VLTI instrument MIDI. This resulted in two refereed publications on AGNs and several important publications submitted or in the pipeline. In particular it should be noted that the quasar 3C273 and the Sy 1 galaxy NGC 4151 have been detected (see Figure 6). The latter is mostly resolved by the interferometer, showing that the IR emission from Sy 1s is NOT dominated by the central hot accretion disk.

The Sombrero galaxy's dust ring

Vlahakis and her collaborators Baes (Gent, Belgium), Bendo (London, UK), and Lundgren (ESO, Chile) used the LABOCA and MAMBO-2 bolometer cameras at wavelengths of 870 micron and 1.2mm, respectively, to detect and image the dust ring of the Sombrero galaxy (NGC 4594) for the first time at (sub)millimeter wavelengths. They constructed a model of the galaxy to separate the active galactic nucleus (AGN) and dust ring components, and found that the ring radius at both 870 micron and 1.2 mm agrees well with that determined from optical absorption and atomic gas studies.

Molecules in galaxy centers

Israel presented and analyzed maps in the four lower ^{12}CO transitions and measurements of the three lower ^{13}CO transitions from the central arcminute in the nearby galaxies NGC 1068, NGC 2146, NGC 3079, NGC 4826, and NGC 7469 (see Figure 7). In all five objects, bright CO concentrations coincide with the galaxy centers. Their line intensities invariably required two distinct gas components before a satisfactory fit between models and data could be obtained. The physical condition of the molecular gas was found to differ from galaxy to galaxy. High kinetic temperatures of 125-150 K occur in NGC 2146 and NGC 3079. Very high densities of 30 000 - 100 000 per cc occur also in NGC 2146 and NGC 3079, as well as in the more distant NGC 7469. The CO-to- H_2 conversion factor X is typically an order of magnitude less than the 'standard' value in the Solar Neighborhood. This means that the central regions do not

contain as much molecular hydrogen as the strength of the CO emission would suggest. The molecular gas is constrained within radii between 0.9 and 1.5 kpc from the nuclei. Within these radii, H_2 masses are typically 125-250 million solar masses. The exception to this is the relatively nearby merger NGC 4826 (the Evil Eye galaxy), where all gas occurs inside a radius of 300 parsec, with a mass of only 30 million solar masses. In all five galaxies, the H_2 mass is typically no more than a few per cent of the dynamical mass in the same region.

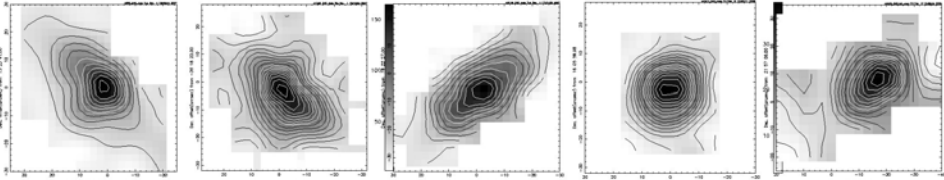


Figure 7a: Compact J=3-2 CO concentrations in the centers of (from left to right) the galaxies NGC 660, NGC 1365, NGC 2146, NGC 432, and NGC 4826, as observed with the JCMT.

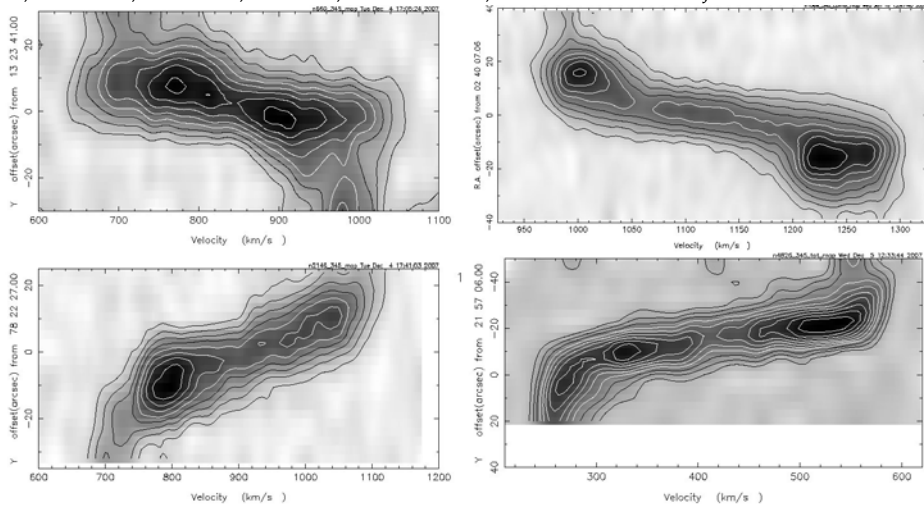


Figure 7b: Major axis position-velocity maps in the J=3-2 ^{12}CO transition of (clockwise from top left) the galaxies NGC 660, NGC 1068, NGC 4826, and NGC 2146, as observed with the JCMT

Infrared studies of nearby starburst galaxies

Brandl, together with Groves, Beirao and colleagues at Cornell University continued the research on the properties of starbursts in different environments. The observational studies, mainly based on data from the Spitzer Space Telescope, included samples of Galactic HII regions, classical starburst galaxies, individual objects such as the Antennae, and low metallicity environments. In parallel, modelling tools have been further developed that now allow the

comparison between observations and physical models. The goal of these activities is the better understanding of the local properties (such as the structure of the PDRs, the relative importance of ultra-compact HII regions, the role of metallicity, and the IMF) in luminous starburst systems.

Powerful H₂ emission from the interacting system Arp 143

Beirao, together with Brandl and colleagues at IPAC (USA), worked on mid-IR (5 - 35 microns) and UV (154 - 232 nm) observations of the interacting galaxy system Arp 143 obtained with the Spitzer Space Telescope and the GALEX observatory. The central nucleus was found to be surrounded by knots of massive star-formation in a ring-like structure. Unusually strong emission from warm H₂, associated with an expanding shock wave between the nucleus and the western knots, has also been found. Arp 143 is one of the most extreme cases in that regard. The ring of star forming knots was formed almost simultaneously in response to the shock wave. However, the knots can be further subdivided in two age groups (approximately 3 and 7 Myr). The older group shows very little PAH emission, which was attributed to an ageing effect of the massive clusters.

Discovery of redshifted [CI] absorption at $z = 0.9$

Bottinelli, van Langevelde, van Dishoeck, Hogerheijde and Tilanus (JCMT, Hawaii, USA), and colleagues from the SMA and the CSO, used the expanded Smithsonian millimeter array (eSMA) at a wavelength of 1.1 mm and detected redshifted neutral carbon absorption at $z = 0.886$ toward the remarkable lensed quasar PKS 1830-211. At an angular resolution of 0.55×0.22 arcsec absorption is seen toward the SW image but not toward the NE image. They also detected CO in the J = 4-3 transition toward the SW component, but failed to see in the same transition the isotopes ¹³CO and C¹⁸O. This was the first time that extragalactic [CI] was detected in absorption, and it allowed a direct determination of the abundance of neutral atomic carbon relative to CO in the molecular clouds of a spiral galaxy at a redshift $z > 0.1$. The deduced C/CO column density ratios ranged from <0.5 (representative of dense cores) to 2.5 (close to translucent clouds ratios) in the different velocity components. This points to environments with different physical conditions or chemical evolution of regions where C has not been completely converted into CO.

5.4. General Galaxy Properties

A new class of submm galaxy?

Vlahakis, Minchin, Dunne, and Eales (the latter three from Cardiff, UK) detected three low redshift ($z < 0.2$) submm galaxies from the Canada-UK Deep

Submillimetre Survey in the CO and HI lines, confirming that these objects have been correctly identified as low redshift sources. They found the HI, molecular gas and dust properties of these galaxies in most respects to be similar to nearby ($z < 0.05$) galaxies, with the main differences being that the mass ratio of molecular gas to dust and the 60/850 micron emission ratio are lower than those of nearby galaxies. They suggest that this implied a population of IR-faint, dust-rich galaxies in the local Universe that hitherto had not been uncovered.

The total dust content of galaxies.

Vlahakis, Falony, Baes (both Gent, Belgium), Davies (Cardiff, UK), and Dale (Laramie, USA) presented a sample of 28 galaxies with well-defined spectral energy distributions (SED) over the entire far-infrared and submillimetre region, selected from the Extended 12 Micron Galaxy Sample. They found that the SEDs of most galaxies clearly indicate the presence of large quantities of cold dust, and found no difference in the cold dust properties of Seyfert 1 and Seyfert 2 galaxies, in agreement with the unified model.

Modelling IR emission from galaxies

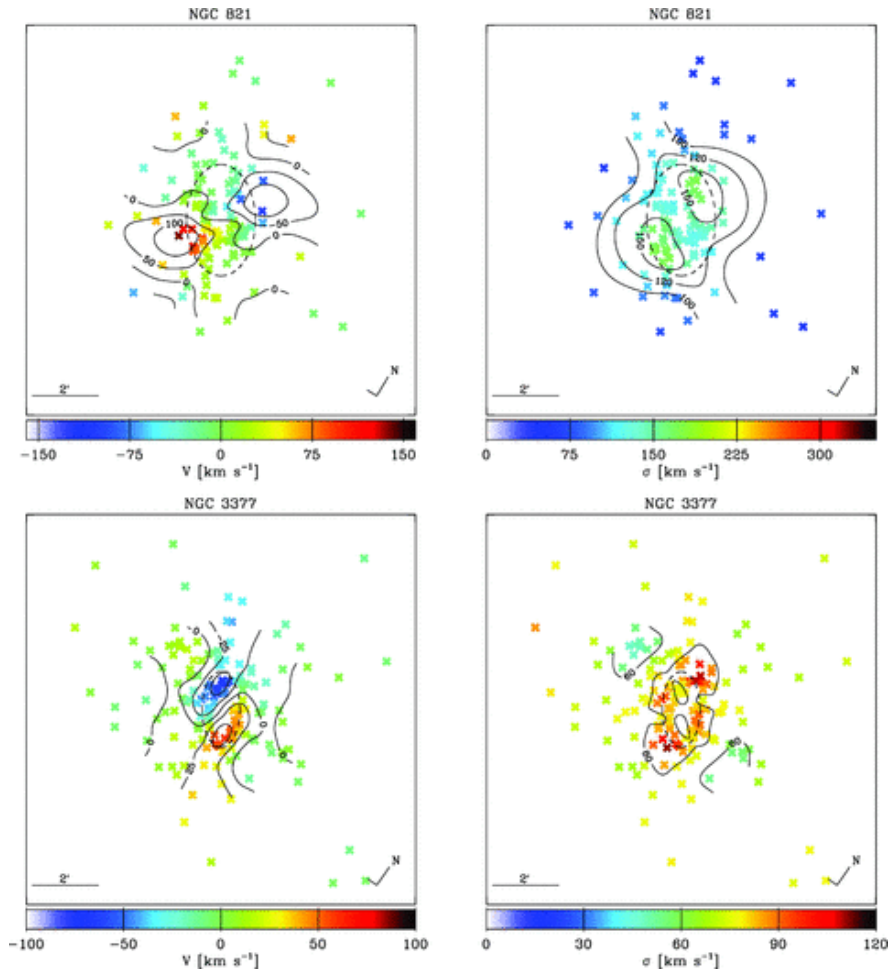
Groves concentrated on modelling emission lines from starburst galaxies and quasi-stellar objects (QSOs) in several wavelength regimes. Together with Allen (Strasbourg, France) and several others, he created a new, updated library of fast, radiative shocks. This work extended and improved earlier work by Dopita and Sutherland to higher velocities and more emission lines, and should prove a fundamental library for the interpretation of emission lines in the future. Building on this work, Groves has started to create an easy-to-use tool for the interpretation of emission lines, enabling the comparison of any emission line ratios with the published MAPPINGS III models for HII regions, AGN narrow line regions and shock excited regions. With this tool, he hopes to make the comparison of models and observations simple and clear for any observer. Groves, Brandl and Nefs also studied the use of the observed correlation between mid-IR emission lines as a diagnostic and predictive tool.

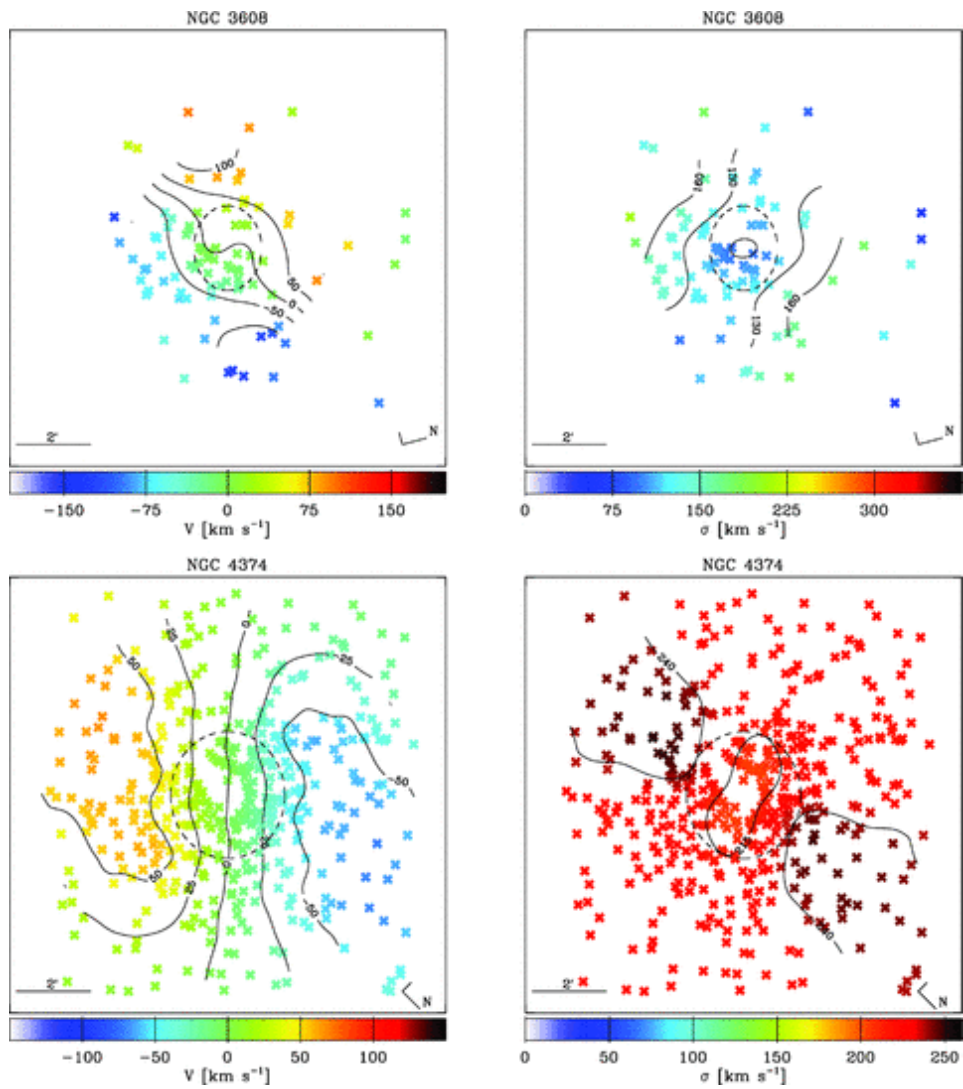
Cooling Flows

Jaffe, Oonk, Hatch, Bremer (Bristol, UK) obtained observing time with the Spitzer Space Telescope for detecting molecular hydrogen in high redshift protoclusters, and obtained Hubble Space Telescope data to detect UV emission in purported star-forming regions in cooling flows. In September, Jaffe organized a Lorentz Workshop on cooling flows with large participation.

Dark matter in the outskirts of elliptical galaxies

Kuijken worked on the distribution of dark matter in the universe, principally through analysis of stellar dynamics in galaxies, using the purpose-built Planetary Nebulae Spectrograph (PN.S) on the William Herschel Telescope in the Canary Islands (Spain). With the other members of the PN.S team (Douglas, Arnaboldi, Capaccioli, Cocato, Freeman, Gerhard, Merrifield, Napolitano, Noordermeer, Romanowsky) he continued the study of elliptical galaxy halos. The PN.S finds, and measures velocities for, planetary nebulae (PNe) in external galaxies from a single observation. The ongoing survey typically yielded 100-200 PNe per galaxy, mostly at large radii from the center where their motions are dominated by the dark matter halo potential. A dozen galaxies now have good datasets, and these were published in 2008. An observing run at the Herschel telescope on La Palma was largely wiped out due to weather; however long-term status for the project was confirmed and the observations are continuing.





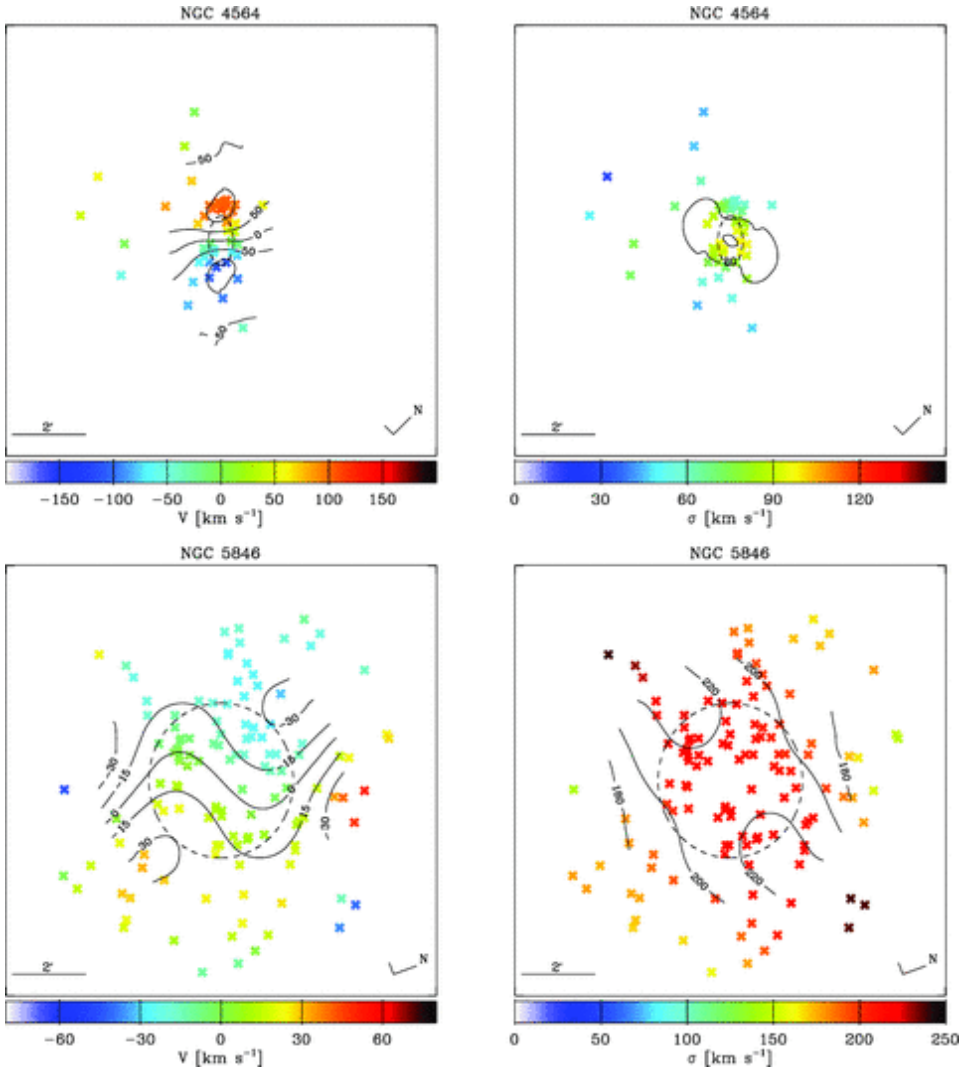


Figure 8: Smoothed two-dimensional velocity (left-hand panels) and velocity dispersion (right-hand panels) fields of six galaxies from PNe data. The photometric major axis is aligned along the vertical axis. Crosses represent the locations of the PNe, while the colours represent the values of the smoothed velocity (or velocity dispersion) field at those points. The colour scale is given at the bottom of each panel. The dashed ellipses are located at 2 effective radii. From Coccato et al, MNRAS 394 1249.

AGN evolution

Continuing his work on the evolution of radio-loud active galactic nuclei, Snellen, de Vries, and Schilizzi conducted a study of very young radio galaxies that shed new light on the questions why certain galaxies become active and how the central activity influences the surrounding galaxy. Multi-epoch VLBI observations confirmed that the spectral turnovers in these sources are caused by synchrotron self-absorption. They also found strong indications that low-luminosity young radio-loud AGN expand slower than highly-powered objects.

Mid-infrared spectra of lensed galaxies

In collaboration with Rigby (Carnegie, USA), Egami and Rieke (Steward Observatory, USA), Van der Werf studied the mid-infrared spectra of strongly lensed submillimetre galaxies (SMGs), using the IRS on the Spitzer Space Telescope. A key object was the triple-lensed SMG behind the massive cluster A2218, an earlier discovery of van der Werf and Knudsen, which was detected with very high signal-to-noise ratio. All objects showed the well-known PAH features characteristic of vigorous star formation. However, the PAH luminosity with respect total infrared luminosity exhibited a modest evolution from $z = 2$ to the present. Since the high aromatic-to-continuum flux ratios in these galaxies rule out a dominant contribution by an active galactic nucleus, this finding implied systematic evolution in the structure, the metallicity, or both, of infrared sources with redshift. It also has implications for the estimates of star-forming rates inferred from 24 micron measurements, in the sense that at $z \sim 2$, a given observed frame 24 micron luminosity corresponds to a lower bolometric luminosity than would be inferred from low-redshift templates of similar luminosity at the corresponding rest wavelength.

Wolf-Rayet galaxies - the largest sample of the most extreme stars

One of the most spectacular events in stellar evolution is the Wolf-Rayet (WR) phase, when a strong stellar wind has exposed the inner, hotter layers of massive stars. Stars in this phase present strong constraints on stellar evolution but are rare in the Milky Way. However, apparently large numbers of these stars are found in the so-called Wolf-Rayet galaxies where the spectral signatures of WR stars show up in the integrated spectra of galaxies.

Until recently only about 130 of these galaxies were known, but together with Kunth and Durret (both IAP, France), Brinchmann has used the Sloan Digital Sky Survey (SDSS) to carry out the largest, and most homogeneous, search to date for WR galaxies. They succeeded in assembling a sample of WR galaxies

several times larger than the total number of these galaxies previously known, with 570 secure and 1115 tentative detections of Wolf-Rayet spectra.

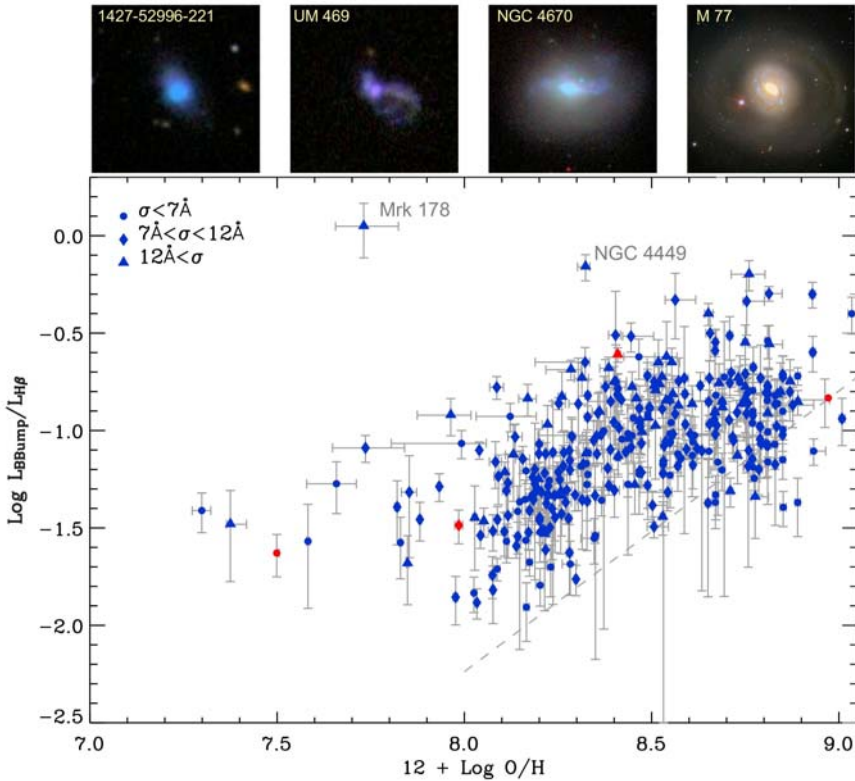


Figure 9: This figure shows the ratio of the luminosity due to optical Wolf-Rayet emission lines to that of the Hydrogen Beta Balmer line as a function of the metal abundance of the interstellar gas in the galaxies. The ratio on the y-axis is approximately proportional to the number of Wolf-Rayet stars to that of O stars. Since the abundance of Wolf-Rayet stars is connected to the strength of stellar winds and stellar winds decrease towards lower metallicity, the ratio declines as well. But note that at the very low metallicity the ratio appears to level off and reach a plateau, indicating the presence of an additional channel for formation of Wolf-Rayet stars, either binary evolution or significant rotation in massive stars. The different symbols indicate different line-widths in the Wolf-Rayet stars and the red symbols indicate the location of the galaxies whose images are shown above the plot. The dashed line indicates the approximate detection limit of the survey.

They used this unprecedentedly large sample to put constraints on the evolution of WR stars and to empirically identify trends in the abundance of WR stars based on the statistics of the galaxies. They also found, for the first time,

evidence of enrichment of the surrounding interstellar medium by winds from WR stars by showing that galaxies with Wolf-Rayet features on average have higher nitrogen abundances than similar galaxies without WR features.

Star formation laws and numerical simulation

When averaged over large scales, star formation in galaxies is observed to follow the empirical Kennicutt-Schmidt (KS) law for surface densities above a constant threshold. While the empirical law involves surface densities, theoretical models and simulations generally work with volume density laws (i.e. Schmidt laws). Schaye and Dalla Vecchia derived analytic relations between star formation laws expressed in terms of surface densities, volume densities, and pressures and showed how these relations depend on parameters such as the effective equation of state of the multiphase interstellar medium. Their analytic relations enabled them to implement observed surface density laws into simulations. Because the parameters of their prescription for star formation are observables, they were not free to tune them to match the observations. They tested their theoretical framework using high-resolution simulations of isolated disc galaxies that assume an effective equation of state for the multiphase interstellar medium. They were able to reproduce the star formation threshold and both the slope and the normalization of arbitrary input KS laws without tuning any parameters and with very little scatter, even for unstable galaxies and even if they used poor numerical resolution. Moreover, they could do so for arbitrary effective equations of state. Their prescription therefore enables simulations of galaxies to bypass our current inability to simulate the formation of stars. On the other hand, the fact that they can reproduce arbitrary input thresholds and KS laws, rather than just the particular ones picked out by nature, indicates that simulations that lack the physics and/or resolution to simulate the multiphase interstellar medium can only provide limited insight into the origin of the observed star formation laws.

Emission lines in galaxies from the mundane to the extreme

Galaxies in the distant universe show emission line properties that offsets from the locus of nearby galaxies. Why that is, has so far been an open question. Brinchmann, Pettini (IoA, UK), and Charlot (IAP, France) have examined the emission line properties of galaxies at low redshift in detail using the Sloan Digital Sky Survey (SDSS). The large SDSS sample enabled to identify trends in the emission line properties of low-redshift galaxies and to identify a subsample of galaxies that match the properties of the high-redshift Universe.

They showed that, for the extreme galaxies in the local Universe, the main offset is caused by a systematic shift towards higher ionization parameters and reasoned that by analogy this is also the case in the distant Universe. They tentatively identified this shift to be due to a higher electron density. They caution that these systematic differences between typical galaxies in the local and distant Universe might cause relationships calibrated using local Universe data to lead to systematic errors when applied at high redshift.

Brinchmann also participated in a related work, led by Liu and Shapley (both Princeton, USA), which independently confirmed these results. The main uncertainty in the results of either effort is the presence of active galaxy nuclei (AGN). The two groups have now joined forces to obtain integral-field spectroscopy of a subsample of these galaxies to further understand the physical nature of these offsets.

6. Distant galaxies, clusters, and large-scale structure

Optical appearance of radio galaxies

Holt continued her work on radio galaxies at optical wavelengths, in collaboration with Tadhunter (Sheffield, UK) and Morganti (Dwingeloo, NL), among others. They presented results on the fast nuclear outflows in compact (young) radio galaxies. Results on the physical conditions and ionisation mechanisms in the nuclear regions of these sources will follow. In addition, Holt presented a review on the host galaxy properties of compact radio galaxies. Work has also continued on the stellar populations in radio galaxies, particularly in radio galaxies with evidence for a young stellar population.

Massive galaxy and cluster formation

Miley, Röttgering, Hatch, Maschietto, Kuiper and many external collaborators continued their studies of high-redshift radio galaxies and their use as laboratories for studying the formation and evolution of massive galaxies and rich clusters at high redshifts ($z > 2$), a field pioneered at the Sterrewacht. An extended review of the field was published by Miley and De Breuck (ESO, Chile). A highlight of this Leiden research on massive galaxy evolution was the study of diffuse emission from the huge merging Spiderweb Galaxy at $z = 2.2$. Approximately half of the observed UV radiation from this galaxy is in the form of "intergalactic light" extended over about 60 kpc. The most probable origin of this light is a multitude of young stars with a star formation rate of more than 80 solar masses per year. A project was begun to extend studies of $z > 2$

protoclusters to older stellar populations using the new HAWK-IU infrared imager on the VLT, with Miley as PI.

Radio relics in distant clusters

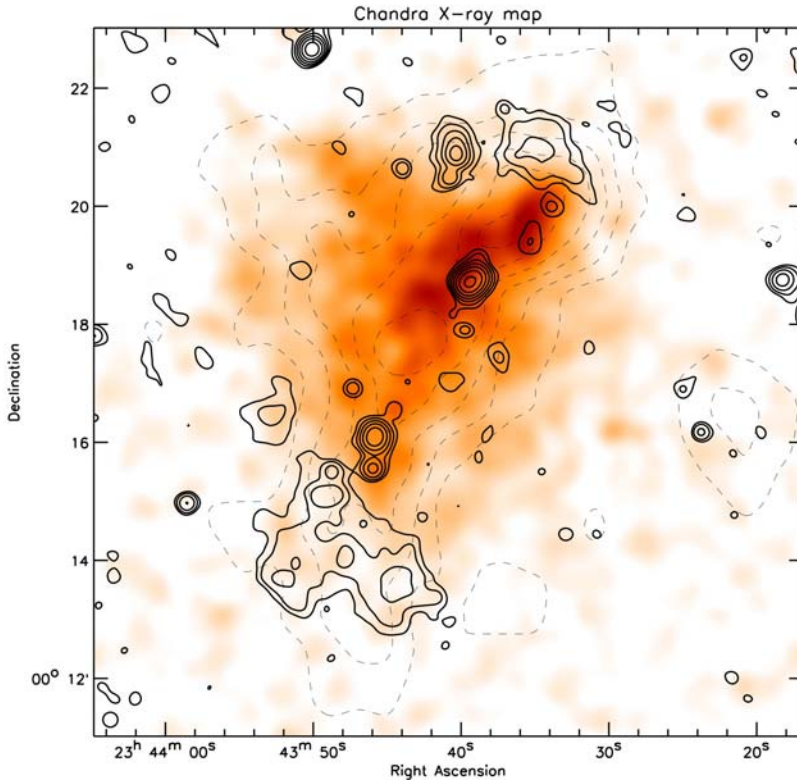


Figure 10: Observations of ZwCl 2341.1+0000 ($z = 0.27$), a complex merging structure of galaxies. The image indicates X-ray emission as observed by Chandra satellite in the 0.5 - 3.0 keV energy band. The solid contours represent the radio emission at 610 MHz from the GMRT radio telescope. The dashed contours show the galaxy distribution from SDSS.

Diffuse radio emission in clusters, radio "relics" and "halos", trace regions with shocks and turbulence created by cluster merger events. van Weeren, Röttgering, Bruggen (Bremen, Germany) and Cohen (NRL, USA) have been carrying out low-frequency radio observations of diffuse ultra-steep spectrum sources with the Giant Meterwave Radio Telescope (GMRT) at 610 MHz. These sources are

thought to trace (i) old long-lived shock fronts, or (ii) less energetic cluster merger events. They used the observations used to construct the first sample of diffuse ultra-steep spectrum sources. In this sample there are several radio relics with spectral indices steeper than those currently known.

Hierarchical models of large-scale structure (LSS) formation predict that galaxy clusters grow via gravitational infall and mergers of (smaller) mass concentrations, such as clusters and galaxy groups. Van Weeren, Röttgering, Joydeep (Pune, India), Raychaudhury (Birmingham, UK) and others have analyzed deep low-frequency (150, 235, 610 MHz) GMRT observations of the complex merging cluster ZwCl 2341.1+0000. After combining these observations with X-ray imaging by the Newton and Chandra satellites, they discovered two radio relics, with a separation of 2.2 Mpc, located on either side of the cluster center. The relativistic electrons responsible for the radio emission are probably accelerated in a large shock-system created by the merger of two massive clusters.

Radio galaxies at high redshifts

High-redshift radio galaxies (HzRGs) are rare objects in the cosmos, residing at the very brightest end of the radio luminosity function. Wide-area surveys have identified powerful radio galaxies out to very early cosmic epochs. However, since flux-limited surveys probe increasingly luminous objects with increasing redshift, knowledge of lower-luminosity HzRGs at high redshift is limited. Croft, van Breugel (LLNL, USA), Röttgering and others used the Keck I telescope to obtain K_s -band images of four candidate high-redshift radio galaxies they selected by using optical and radio data in the NOAO Deep Wide-Field Survey in Boötes. Spectral energy distribution fitting suggested that three of these objects are at $z > 3$, with radio luminosities near the FR-I/FR-II break. Two of those exhibit diffuse morphologies in K_s -band, suggesting that they are still in the process of forming.

The Combined EIS-NVSS Survey Of Radio Sources (CENSORS) is a 1.4-GHz radio survey selected from the NRAO VLA Sky Survey (NVSS) and complete to a flux density of 7.2 mJy. It targeted the ESO Imaging Survey (EIS) Patch D. Brookes, Best, Peacock (all Edinburgh, UK), Röttgering, and Dunlop (Edinburgh, UK) carried out spectroscopic observations of 143 of the 150 CENSORS sources. The observations resulted in secure spectroscopic redshifts for 63 per cent of the sample and probable redshifts (such as those based on a single emission line) for a further 8 per cent. Following the identification of the quasars and star-forming

galaxies in the CENSORS sample, estimated redshifts were calculated for the remainder of the sample via the $K - z$ relation for radio galaxies.

Tasse, Röttgering and Best (Edinburgh, UK) identified the optical and infrared counterpart of the point-like X-ray sources in the XMM-LSS field, and selected a subsample of Type-2 AGNs. The X-ray luminosity function of these sources were in good agreement with previous studies. The fraction of galaxies that are X-ray AGN is a strong function of the host galaxy stellar mass and the shape of that relation is in good agreement with the fraction of galaxies that are emission line AGN, while it significantly differs from the same relation for the radio selected AGN. The AGN in the sample showed a strong infrared excess, at wavelength as short as 3.5 micron, suggesting the presence of hot dust, while they are preferentially found in underdense environment, where galaxy mergers and interaction are likely to occur. Tasse and colleagues suggested that the X-ray selection probes a population of AGN that have actively accreting black holes (quasar mode), due to a galaxy merging event, in contrast to the conclusion they had reached for the sample of radio loud objects in the XMM-LSS field. For those objects they argued that the radio loudness in the most massive galaxies had their AGN activity triggered by the cooling of the hot gas that observed in their atmospheres.

High redshift galaxies: Lyman Alpha Blobs

Weijmans, with Bower and Swinbank (both Durham) analysed deep SAURON integral-field data of a Lyman Alpha emission halo at redshift 3.1. With these new observations, taken in addition to an earlier shallower dataset with the same instrument, she found that the emission halo consists of four separate, smaller blobs. By overplotting optical data from STIS/HST and IRAC data of the Spitzer Telescope, it was shown that the blobs have different origins, as one is identified as a Lyman Break galaxy, one as an IRAC source and the other two are not detected in either image. This hints to different ionisation mechanisms, and further analysis is on-going.

Galaxy Clustering and dark matter

Quadri and colleagues have obtained the most precise measurement thus far of the clustering of massive, red galaxies at $z \sim 2-3$. These galaxies have a very large correlation length, which suggests that they occupy the most massive dark matter halos, and that some physical process that is largely confined to the most massive halos makes galaxies red. However, the clustering may be too strong, since it is difficult to reconcile with models of dark matter halos. The biggest uncertainty in this analysis comes from the use of photometric redshifts. We

have begun a new survey which will improve photometric redshift accuracy by a factor of 3-4 and will allow us to check whether there is tension between the observations and the models.

Galaxy bimodality

It has long been known that galaxies in the local universe follow bimodal distributions in many of their properties, such as optical color. How this bimodality evolved over cosmic time is an important open question. Addressing this question requires deep multiwavelength data over large fields and accurate photometric redshifts. A complication is that the bimodality in optical color may seem to disappear because of a change in the dust properties of distant galaxies, whereas the underlying bimodality of specific star formation rates remains. Quadri and colleagues checked this by incorporating rest-frame near-infrared color, and established that the bimodality is present to at least $z \sim 1.5-2$.

Huge star-forming regions in high-redshift galaxies

Van der Werf and van Starckenburg continued their study of the dynamical properties of infrared-selected high-redshift galaxies, which led to the completion of Van Starckenburg's PhD thesis at the end of the year. A highlight of the work was the discovery that strongly star-forming disk galaxies at high redshift have very high gas velocity dispersions. This leads to a greatly increased Jeans length, which in turn provides a natural explanation for the observation that these galaxies are dominated by a small number of huge (several kpc size) star-forming regions. One galaxy from the sample was revealed to have an exceptionally large gas-to-stellar mass ratio of 2.5, underlining its nature as a galaxy that is still in formation.

Unusually compact massive galaxies at the high redshift $z = 2.3$

Van Dokkum (Yale, USA), Franx, and collaborators studied massive galaxies at a redshift $z = 2.3$ with little apparent star formation. Earlier, Kriek and coworkers had determined, from deep spectroscopy in the near-infrared, that about 45% of all massive galaxies around $z = 2.3$ have evolved stellar populations and little or no ongoing star formation. Van Dokkum et al used deep, high-resolution images obtained with HST/NIC2 and with the laser guide star (LGS)-assisted Keck/adaptive optics (AO) system to determine the sizes of these quiescent galaxies. Considering that they have a median (stellar) mass of 170 billion solar masses, comparable to the mass of the Milky Way, the galaxies are remarkably small, with a median effective radius of only 0.9 kpc. With a similar mass, galaxies in the nearby universe have typical sizes of 5 kpc, and their average

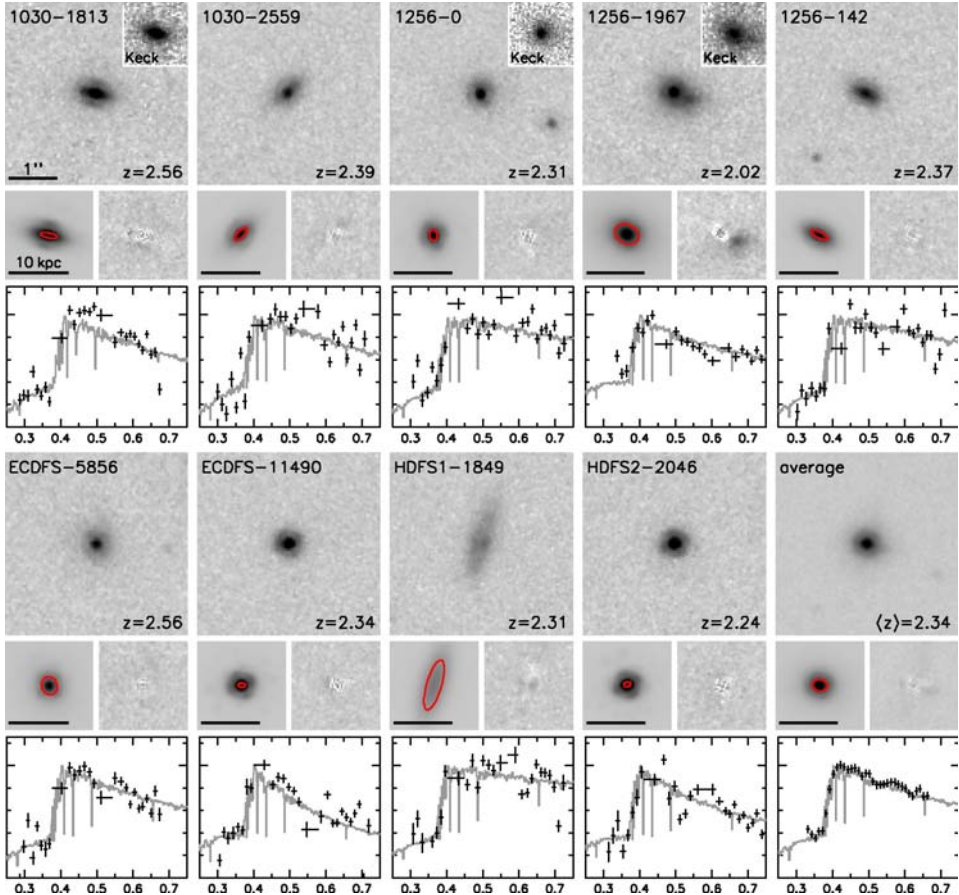


Figure 11: van Dokkum, Franx, Kriek, and collaborators studied quiescent, massive galaxies at $z=2.4$ with NICMOS. The resulting images are shown above. The galaxies have stellar masses of more than 10^{11} solar masses, but are nearly unresolved in the high quality NIC2 imaging. Each box shown is 3.8×3.8 arcsec. The solid bar indicates a length of 10 kpc. The small panels below each galaxy show the best-fitting Sersic model (convolved with the PSF) and the residual after subtraction of the best-fitting model. The red ellipses are constructed from the best-fitting effective radii, axis ratio s , and position angles. Note that the ellipses are significantly smaller than 10 kpc, which is the effective diameter of typical massive elliptical galaxies in the nearby universe. Gemini GNIRS spectra from Kriek et al. (2006) are also shown. Insets show Keck LGS/AO images of three galaxies. The typical effective radius of the galaxies is 1 kpc, 5 times smaller than the size of nearby galaxies of the same mass. Hence these passive galaxies have grown in size by nearly a factor of 5.

stellar densities are thus two orders of magnitude lower than those of the galaxies at $z = 2.3$. These results extend earlier work on galaxies at a redshift around $z = 1.5$ and confirm previous studies of galaxies at $z > 2$ that lacked

spectroscopic redshifts and imaging of sufficient resolution to resolve the galaxies. These findings also demonstrate that fully assembled early-type galaxies make up at most a tenth of the population of K-selected quiescent galaxies at $z = 2.3$, and effectively rule out simple monolithic models for their formation. The galaxies must evolve significantly after the epoch corresponding to $z = 2.3$. They may do so through dry mergers or other processes, consistent with predictions from hierarchical models.

Kriek (Princeton, USA), Franx, and collaborators studied the red sequence at a redshift of 2.3 in a sample drawn from their near-infrared spectroscopic survey for massive galaxies. The color distribution shows a statistically significant red sequence, which hosts $\sim 60\%$ of the stellar mass at the high-mass end. The red-sequence galaxies have little or no ongoing star formation, as inferred from both emission-line diagnostics and stellar continuum shapes. Their strong Balmer breaks and their location in the rest-frame (U-B), (B-V) plane indicate that they are in a post-starburst phase, with typical ages of 0.5-1.0 Gyr. In order to study the evolution of the red sequence, Kriek and coworkers compared their high-redshift sample with massive galaxy samples in the Local Universe ($0.02 < z < 0.045$) and at modest redshifts ($0.6 < z < 1.0$). The rest-frame (U-B) color of a galaxy of given mass reddens by about 0.25 mag from $z = 2.3$ to the present.

Kriek, Franx, and collaborators also published their spectroscopic catalogue of galaxies around $z = 2.3$ observed in the rest-frame near-infrared with GNIRS on the Gemini-South telescope.

Galaxy evolution

Van der Wel (Heidelberg, D), Franx, and collaborators analyzed the size evolution of galaxies at fixed velocity dispersion. Using measured dispersions and sizes, they found significant evolution to $z = 1$, consistent with the trend observed out to $z = 2$ and beyond based on masses derived from stellar population fits.

Damen, Franx and collaborators investigated the evolution of star formation of massive, mid-infrared selected galaxies from redshift $z \sim 1.8$ to $z = 0$. They found that the highest-mass galaxies have the lowest specific star formation rates and that the average specific star formation rate increases with redshift at a rate that is similar for all masses. The fraction of massive galaxies with quenched star formation decreases with redshift out to $z \sim 1.8$, where they take up at least $\sim 19\%$ of the population. This number can serve as a constraint for models of galaxy evolution.

Deep fields

Franx and collaborators published an analysis of galaxies in the Chandra Deep Field (CDF) South. To a redshift of three, they found a tight relation between color and size at a given mass, red galaxies being small and blue galaxies being large. They showed that the relation is driven by stellar surface density or inferred velocity dispersion: galaxies with a high surface density are red and have low specific star formation rates, and galaxies with a low surface density are blue and have high specific star formation rates. Surface density and inferred velocity dispersion are better correlated with specific star formation rate and color than stellar mass. This implies that stellar mass by itself is not a good predictor of the star formation history of galaxies. In general, galaxies at a given surface density have higher specific star formation rates at higher redshift. Specifically, galaxies with a surface density of the order of two billion solar masses “red and dead” at low redshift, about half of them are forming stars at a modest redshift of one, and almost all are forming stars at redshifts of two. This provides more direct evidence for the late evolution of galaxies onto the red sequence. At a given mass, the size of a galaxy evolves as $1/(1+z)^{0.6}$. Hence, galaxies experience significant upsizing in their history. The size evolution is fastest for the highest mass galaxies and for quiescent galaxies. The persistence of the structural relations from redshifts of zero up to redshifts $z = 2.5$, and the upsizing of galaxies imply that a relation analogous to the Hubble sequence exists over this full redshift range, and possibly at redshifts beyond. Star-forming galaxies at redshifts larger than $z = 1.5$ are quite different from star-forming galaxies in the Local Universe, as they probably have very high gas mass fractions, and have star formation timescales comparable to orbital times.

Wuyts (CfA, USA), Franx, and collaborators published multi-wavelength photometry of the CDF-South. The catalogue spans wavelengths ranging from the U band through 24 microns in the infrared.

Holt worked on the preparations for the UltraVISTA survey, a deep near-IR survey of the COSMOS field to start in 2009, led by Franx, Dunlop (Victoria, Canada), Fynbo (Copenhagen, Denmark) and Le Fevre (Marseille, France). Her work included selection and testing of data reduction pipelines and investigations into observing strategy and the exact positioning of the survey in the field.

Williams, Quadri, Franx, and collaborators investigated the bimodal (star-forming versus quiescent) galaxy population in a large near-IR selected sample from the ultra-deep subfield of the UKIRT Infrared Deep Sky Survey. They

found that the bimodality seen locally persists at least up to $z = 2$, and that quiescent galaxies are more strongly clustered (and hence inhabit more massive halos) than those which are actively forming stars.

Dark matter halo concentrations in the WMAP year 5 cosmology

Duffy (Manchester), Schaye, Kay (Manchester) and Dalla Vecchia used a combination of three large N-body simulations to investigate the dependence of dark matter halo concentrations on halo mass and redshift in the Wilkinson Microwave Anisotropy Probe year 5 (WMAP5) cosmology. They found that the median relation between concentration and mass is adequately described by a power law for halo masses in the range 10^{11} - $10^{15} M_{\text{solar}}/h$ and redshifts $z < 2$, regardless of whether the halo density profiles are fitted using Navarro, Frenk & White or Einasto profiles. Compared with recent analyses of the Millennium Simulation, which uses a value of σ_8 that is higher than allowed by WMAP5, $z = 0$ halo concentrations are reduced by factors ranging from 23 per cent at $10^{11} M_{\text{solar}}/h$ to 16 per cent at $10^{14} M_{\text{solar}}/h$. The predicted concentrations are much lower than inferred from X-ray observations of groups and clusters. The abundance of oxygen in the intergalactic medium

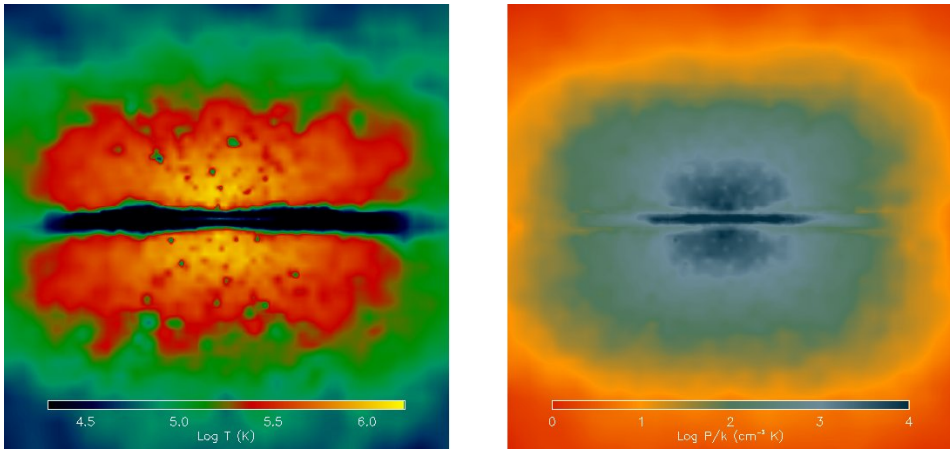


Figure 12: Edge-on projections of the gas temperature (left) and pressure (right) for a model disc galaxy in a $10^{12} M_{\odot}$ halo. The image shows a snapshot of the simulation 250 Myr after winds driven by supernovae were turned on. The image is 45 kpc/h on a side. The color coding is logarithmic in pressure. Energy from supernovae drives a bi-conical outflow perpendicular to the disk. By the time shown, thermal instabilities in the hot wind fluid are starting to result in the formation of dense clouds. Many of these clouds are in fact falling in rather than flowing out. The figure was taken from Dalla Vecchia & Schaye (2008).

Abundances in the InterGalactic Medium

Aguirre, Dow-Hygelund (both UCSC, USA), Schaye, and Theuns (Durham, UK) have studied the abundance of oxygen in the intergalactic medium (IGM) by analyzing O VI, C IV, Si IV, and H I pixel optical depths derived from a set of high-quality VLT and Keck spectra of 17 quasars at redshifts $2.1 < z < 3.6$. Comparing ratios of oxygen and carbon optical depths to those in realistic, synthetic spectra drawn from a hydrodynamical simulation and comparing to existing constraints on [Si/C], they were able to place strong constraints on the ultraviolet background (UVB) model using weak priors on allowed values of [Si/O]: for example, a quasar-only background yields [Si/O] ~ 1.4 , which is highly inconsistent with the [Si/O] ~ 0 expected from nucleosynthetic yields and with observations of metal-poor stars. Assuming a fiducial quasar+galaxy UVB consistent with these constraints yielded the primary result that [O/C] = 0.66. Subdividing the sample revealed no evidence for evolution, but low and high HI optical depth samples were inconsistent, suggesting either density dependence of [O/C] or-more likely-prevalence of collisionally ionized gas at high density.

The ultraviolet luminosity fuction a very high redshifts

Bouwens (Santa Cruz, USA), Franx, and collaborators analyzed the observations of very high redshift galaxies in deep HST-imaging data. They found eight $z = 7.3$ dropouts in their search fields, but no $z = 9$ J-dropout candidates. A careful consideration of a wide variety of different contaminants suggested an overall contamination level of just 12% for their z-dropout selection. They performed detailed simulations to accurately estimate the selection volumes, and derived constraints on the ultraviolet luminosity functions at both $z = 7$ and $z = 9$. Their search results for $z = 9$ J-dropouts set a one-sigma lower limit on $M(\text{UV})$ of -19.6 mag, 1.4 mag fainter than their best-fit value at redshift $z = 4$. This suggests that the ultraviolet luminosity function has evolved substantially over this time period. In fact, no-evolution is ruled out verry high confidence levels.

Gravitational lensing studies

Hoekstra continued his work on several large imaging surveys, carried out with the Canadian-French-Hawaiian Telescope (CFHT). His work on the multi-wavelength study of 50 massive clusters, the Canadian Cluster Comparison Project is nearing completion. This project involves a careful comparison of masses derived from a weak gravitational lensing analysis to those derived from X-ray and radio observations. Weak lensing masses have been derived, and Mahdavi (San Francisco, USA) is finalizing the determination of hydrostatic X-ray masses. Once completed, this will be the largest study of its kind. Earlier

results have already attracted much attention from the cluster community and have helped improve constraints on cosmological parameters.

The study of large scale structure through weak gravitational lensing forms another important component of Hoekstra's research. The main survey used to this end is the CFHT Legacy Survey, which involves a large number of collaborators across the globe. The acquisition of data is now complete and a full scale analysis of the data is underway. The lensing group in Leiden is providing a large effort. Current work focusses on improving the corrections for observational distortions and the determination of adequate photometric redshifts.

The second generation Red-sequence Cluster Survey (RCS2) is a large, shallow imaging survey. The weak lensing analysis of these data forms the basis of the van Uitert's PhD thesis. Scientific aims include the measurement of cosmological parameters using cluster counts and the study of dark matter halos using weak gravitational lensing.

7. Models and simulations

Radiative transfer algorithms

Icke formulated Ritzerveld's SimpleX algorithm for radiative transfer on a Voronoi-Delaunay grid as a stationary Markov process. In this algorithm, parcels of radiation are shuttled along lines connecting points (nodes) that represent the scattering medium. By choosing suitable connections between sources and boundary points, this problem can be cast into the form of a classical Markov process. Inversion of the Markov matrix then yields the stationary solution of the corresponding radiative transfer problem. By making judicious use of the sparseness of the matrix, this method was made to run extremely fast.

Kruip investigated and quantified error properties of Ritzerveld's SimpleX radiative transfer method. Analytical descriptions of the error-generating phenomena due to anisotropies in the irregular grid, intrinsic to the SimpleX algorithm, have been verified by means of numerical simulations. Kruip showed that unphysical behaviour can be corrected with a computationally cheap weighting scheme. Furthermore, several improvements of the method in both accuracy and efficiency have been made. Most notably, a means of controlling

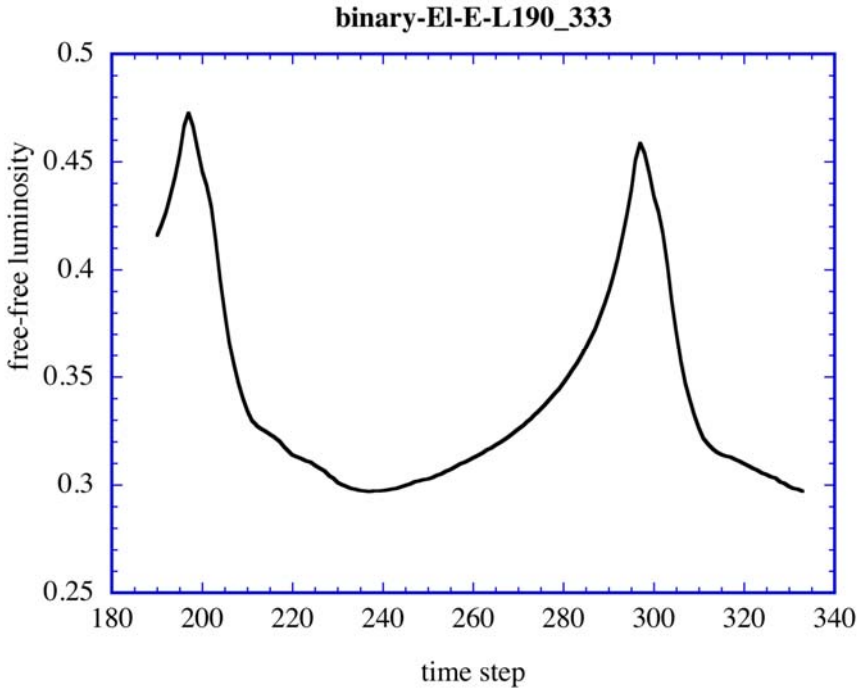


Figure 13: Markov solution of a radiative test problem of a point source in a homogeneous atmosphere, using 1000 points representing the gas.

the amount of diffusion of the radiative transfer has been developed. The work presented gives users of SimpleX a direct handle on the area of applicability of the method and helps assess the accuracy of obtained results.

Radiative transfer on parallel, dynamic, unstructured grids

Paardekooper extended Ritzerveld's SimpleX method for use on distributed memory architectures. This resulted in both a faster method and, more importantly, the opportunity to do larger simulations that are no longer limited by the available memory on one node.

Furthermore, Paardekooper modified the SimpleX code to work on a dynamic grid, instead of the static grid that was used before. Updating the grid significantly reduces the numerical scatter that was inherent to the method. Results of test problems show a better resemblance to the analytical solution (if

available) and the results of other, more conventional radiative transfer methods, while the advantages of SimpleX, being the high computational speed and the independence on the number of sources thereof, remain.

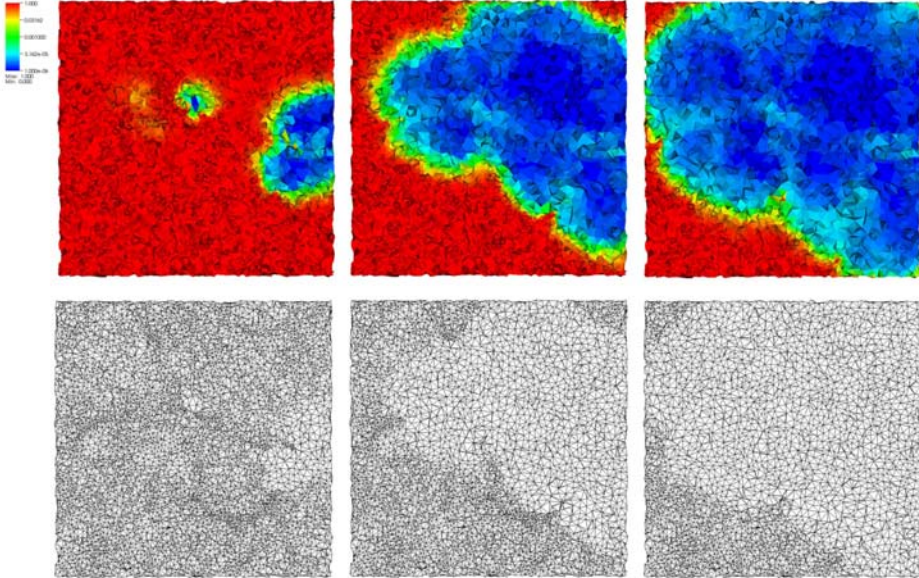


Figure 14: The reionisation of a realistic cosmological density field at different times and the corresponding grid. The image shows the neutral fraction, cut through the middle of the box (z -plane) at $t = 0.05$ Myr (left), $t = 0.2$ Myr (middle) and $t = 0.4$ Myr (right). The grid is updated according to the changing local optical depth.

TRAPHIC - radiative transfer for SPH simulations

Pawlik and Schaye finished developing TRAPHIC, a novel radiative transfer scheme for smoothed particle hydrodynamics (SPH) simulations. TRAPHIC is designed for use in simulations exhibiting a wide dynamic range in physical length-scales and containing a large number of light sources. It is adaptive both in space and in angle and can be employed for application on distributed memory machines. The commonly encountered computationally expensive scaling with the number of light sources in the simulation is avoided by introducing a source merging procedure. The (time-dependent) radiative transfer equation is solved by tracing individual photon packets in an explicitly photon-conserving manner directly on the unstructured grid traced out by the set of SPH particles. To accomplish directed transport of radiation despite the irregular spatial distribution of the SPH particles, photons are guided inside

cones. They presented and tested a parallel numerical implementation of TRAPHIC in the SPH code GADGET-2, specified for the transport of monochromatic hydrogen-ionizing radiation. The results of the tests were in excellent agreement with both analytic solutions and results obtained with other state-of-the-art radiative transfer codes.

Numerical Simulations of the Warm-Hot Intergalactic Medium

Bertone (UCSC, USA), Schaye, and Dolag (MPA, Heidelberg, Germany) reviewed the current predictions of numerical simulations for the origin and observability of the warm hot intergalactic medium (WHIM), the diffuse gas that contains up to 50 per cent of the baryons at $z = 0$. During structure formation, gravitational accretion shocks emerging from collapsing regions gradually heat the intergalactic medium (IGM) to temperatures in the range of a hundred thousand to ten million Kelvin. The WHIM is predicted to radiate most of its energy in the ultraviolet (UV) and X-ray bands and to contribute a significant fraction of the soft X-ray background emission. While O VI and C IV Absorption systems arising in the cooler fraction of the WHIM with temperatures of a few hundred thousand Kelvin are seen in FUSE and Hubble Space Telescope observations, models agree that current X-ray telescopes such as Chandra and XMM-Newton do not have enough sensitivity to detect the hotter WHIM. However, future missions such as Constellation-X and XEUS might be able to detect both emission lines and absorption systems from highly ionised atoms such as O VII, O VIII and Fe XVII.

Simulating galactic outflows with kinetic supernova feedback

Feedback from star formation is thought to play a key role in the formation and evolution of galaxies, but its implementation in cosmological simulations is currently hampered by a lack of numerical resolution. Dalla Vecchia and Schaye presented and tested a subgrid recipe to model feedback from massive stars in cosmological smoothed particle hydrodynamics simulations. The energy is distributed in kinetic form among the gas particles surrounding recently formed stars. They studied the impact of the feedback using a suite of high-resolution simulations of isolated disk galaxies embedded in dark haloes with total mass 10^{10} and $10^{12} M_{\text{solar}}/h$. They focused in particular on the effect of pressure forces on wind particles within the disk, which they turned off temporarily in some of their runs to mimic a recipe that has been widely used in the literature. They found that this popular recipe gives dramatically different results because (ram) pressure forces on expanding superbubbles determine both the structure of the disc and the development of large-scale outflows. Pressure forces exerted by expanding superbubbles puff up the disk, giving the dwarf galaxy an

irregular morphology and creating a galactic fountain in the massive galaxy. Hydrodynamic drag within the disk results in a strong increase in the effective mass loading of the wind for the dwarf galaxy, but quenches much of the outflow in the case of the high-mass galaxy.

8. Projects and instrumentation

8.1. Projects

KiDS and CFHTLS: studying dark matter with light rays

Weak gravitational lensing can be used to study the mass distribution around galaxies, as well as on larger scales. Kuijken is the Prime Investigator (PI) of the KiDS project, which was conceived with this in mind, and is a large collaboration of nine institutes in Europe. The KiDS project will map 1500 square degrees of sky in good seeing conditions from Paranal with OmegaCAM on the VLT Survey Telescope (VST). Unfortunately, the telescope construction

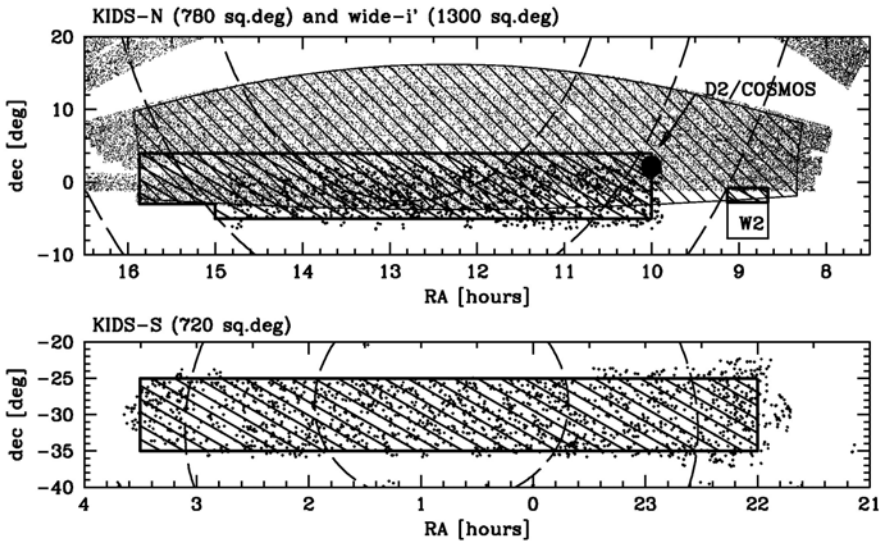


Figure 15 The Kilo-Degree Survey, to be carried out with OmegaCAM as soon as it can be installed on the VLT Survey Telescope, and with VISTA. The survey is divided in two regions, of total area 1500 square degrees, which will each be covered in 9 bands, from u to K. The KIDS areas have already been the target of extensive spectroscopic redshift surveys, using 2DF on the AAT (both regions, fat dots) and Sloan (KIDS-N, small dots).

A larger area, wide-*i*, will be covered in *i* band only, in order to search for high redshift quasars in combination with the UKIDSS near-IR survey.

has been long delayed, with start of operations in 2009 considered likely at the time of writing. During 2008 preparations for KiDS continued in algorithm development for multi-colour photometry and for weak lensing measurement.

Since 2007 the KiDS project has benefited from Leiden's participation in a European training network, 'DUEL', built around the scientific challenges in determining the cosmological model with weak lensing measurements. The lensing group in Leiden now consists of postdocs Schrabback and Hildebrandt, PhD students Smit, Welander and van Uitert, and new faculty member Hoekstra, as well as several MSc students. A major development was the involvement in the analysis of the Canada-France-Hawaii Telescope Legacy Survey (CFHTLS), currently the most powerful data set for weak lensing measurements. The CFHTLS comprises 170 square degrees of sky imaged in five bands. Subsets of the survey have already been used in weak lensing studies, also under the lead of Hoekstra.

After an independent reduction of 37 square degrees of CFHTLS-Wide data by Erben (Bonn, Germany), Hildebrandt, Schrabback, and collaborators, the efforts of the different teams were joint in the creation of the 'CFHTLS Systematics Collaboration' in April 2008, with local members Kuijken, Hoekstra, Hildebrandt, Schrabback, Smit, van Uitert, and Velander. This team of European and Canadian scientists currently conducts a thorough weak lensing analysis of the complete CFHTLS-Wide data, which includes careful corrections for residual systematics and full utilization of the available photometric redshift (photo- z) information. This analysis will enable the full scientific exploitation of the survey and is expected to both yield substantial new insight into the relation of luminous and dark matter, and place tight constraints on cosmological parameters.

As part of the CFHTLS-Wide analysis, Schrabback developed a new tool for the interpolation of the image point-spread function using principal component analysis. This tool has also been successfully applied to the HST COSMOS data, where it efficiently removes systematics present in earlier studies, allowing for a clean measurement of the cosmological lensing signal.

The photo- z catalogues for the CFHTLS-Wide, which are also used by the 'Systematics Collaboration', were provided by Hildebrandt. He compared these photo- z 's to other catalogues available for the CFHTLS-Wide in collaboration with Coupon (Paris) in order to understand the limitations and improve the accuracy of the current dataset. This photo- z knowledge is also used on the

Deep part of the CFHTLS where Hildebrandt studied the clustering of Lyman-break galaxies at redshifts $z = 3-5$ constraining their relationship to the underlying dark matter field.

The SAURON project

De Zeeuw, van den Bosch and Weijmans are members or associates of the SAURON team that has built a panoramic integral-field spectrograph for the 4.2m William Herschel Telescope on La Palma, in a collaboration which involves groups in Lyon (Bacon) and Oxford (Davies). SAURON was funded in part by a grant from NWO to de Zeeuw, and was built at Observatoire de Lyon. SAURON was used to measure the kinematics and linestrength distributions for a representative sample of 72 nearby early-type galaxies (ellipticals, lenticulars, and Sa bulges, in clusters and in the field). The entire survey was completed in 2003, and since then several follow-up projects were carried out on specific targets. In parallel with the data taking, the team developed a number of tools that are key to analyse all the resulting maps.

The ATLAS 3D Project

The Atlas 3D Survey (PIs: McDermid (Gemini), Emsellem (Lyon), Cappellari and Krajnovic (Oxford)) of a complete, volume-limited sample of early-type galaxies using the integral-field spectrograph SAURON on the WHT, continues to gather momentum. 2008 saw the completion of the four observing runs and finalisation of the data reduction. The project also launched an observational campaign to measure molecular and neutral gas components of these galaxies using the IRAM 30m telescope (PI Combes, Paris) at Pico Veleta, Spain and the Westerbork Synthesis Radio Telescope (PI Morganti, ASTRON) at Dwingeloo, the Netherlands. Together with complementary imaging data from the Sloan Digital Sky Survey and Isaac Newton Telescope, and archival data from Chandra, GALEX and Spitzer, this project aims to provide a broad but detailed view of our local early-type galaxy population, creating a local benchmark for studies of galaxy formation and evolution.

This survey obtained Large Program status at the WHT, and as such constitutes a legacy survey for the WHT community. Reduced data and derived products will be made publicly available 12 months after the final data are taken, creating the world's largest available database of fully-calibrated integral-field spectroscopic data. The collaboration includes Leiden co-investigators de Zeeuw, van den Bosch and Weijmans, as well as additional international collaborators.

8.2 Facilities

The eSMA

The eSMA ("expanded SMA") combines the Smithsonian Millimeter Array (SMA), the James Clerk Maxwell Telescope (JCMT) and the Caltech Submillimeter Observatory (CSO) into a single facility, providing greater sensitivity and spatial resolution owing to the increased collecting area at the longest baselines. Until the early science observing with the Atacama Large Millimeter Array (ALMA), expected to occur in 2011), the eSMA will be the facility with the highest angular resolution obtainable at the frequency 345 GHz (0.8 mm wavelength). The gain in sensitivity and resolution will bring new insights in a variety of fields, such as protoplanetary disks and transition disks, high-mass star formation, solar system bodies, nuclei of nearby and high- z galaxies. Progress towards making the eSMA into a working interferometer involved Bottinelli, Tilanus (JCMT, Hawaii, USA), van Langevelde, Hogerheijde, and van Dishoeck and many colleagues from SMA and CSO. It included (i) new 345-GHz receivers installed at the JCMT and CSO; (ii) numerous tests performed for receiver, correlator and baseline calibrations in order to determine the effects arising from the differences between the three types of antennas; (iii) first fringes and images at 345 GHz. The scientific results obtained during the initial science verification observations at 260 GHz included the first absorption measurement of the C/CO ratio in a galaxy at a redshift $z = 0.89$ and imaging of the vibrationally excited HCN line towards IRC+10216.

ALLEGRO: the ALMA Regional Center node in the Netherlands

The past year saw significant progress in the construction of the Atacama Large Millimeter/Submillimeter Array (ALMA). In Chile, the construction of the Operations Support Facilities (OSF) just outside San Pedro de Atacama at 2900 m, and the building at the Array Operations Site (AOS) on the 5000 m high Llano de Chajnantor were completed. The first segments of the correlator were installed at the AOS, and the first ALMA antenna was delivered by industry to the project and has started commissioning at the OSF. At Leiden Observatory, the ALMA Regional Center node (Allegro, ALMA Local Expertise Group) took further shape with the creation of its dedicated website (www.strw.leidenuniv.nl/allegro) and the hiring of its first postdoc, Frieswijk (stationed at the Kapteyn Institute, Groningen). One of Frieswijk's activities is the exploitation of the enhanced SMA (the link-up of the Submillimeter Array with the James Clerk Maxwell Telescope and the Caltech Submillimeter Observatory) as a testbed for future ALMA observations. The next several years will see a significant expansion of the Allegro activities in Leiden.

LOFAR

An important goal driving the development of the Low-Frequency Array (LOFAR) since its inception is the exploration of the low-frequency radio sky by means of a series of unique surveys. Low-frequency radio telescopes are ideally suited for carrying out large-sky surveys, because of their huge instantaneous fields of view and the all-sky nature of their calibration. Four topics in particular have been identified for the proposed surveys. Three of these involve fundamental areas of astrophysics for which LOFAR is likely to make substantial contributions.

These are: (i) Formation of massive galaxies, clusters and black holes using $z \sim 6$ radio galaxies as probes, (ii) Intercluster magnetic fields using diffuse radio emission in galaxy clusters as probes, (iii) Star formation processes in the early Universe using starburst galaxies as probes.

Because LOFAR is the first radio synoptic telescope that will open up a new observational spectral window, the fourth topic is: (iv) Exploration of new parameter space for serendipitous discovery.

In 2008, LOFAR underwent an important transition from its design phase to the rollout of the actual station and central processing hardware. All tenders for station hardware have been closed and orders for the various components were placed with industry. Groundwork in the LOFAR core has been underway since mid-July in preparation for the placement of the first stations. Similarly, vendors for the central processing (CEP) systems including the wide-area network (WAN) equipment and post-processing cluster have been selected and hardware has started to arrive. Most spectacularly, the project also completed the upgrade of the LOFAR correlator to a BG/P supercomputer over the summer.

Despite the activity surrounding the delivery of the new hardware, development and commissioning work on the LOFAR control software and science pipelines has continued unabated.

The Leiden Survey Key Project Team (Röttgering, Snellen, Miley, Mohan, Pandey, Omar, Usov, van Bemmell, and Intema) has continued to push ahead with their pipeline to produce high-quality all-sky mosaics and catalogues of extracted source properties. First versions of their source extraction software were completed and successfully integrated into an Astro-WISE pipeline framework. Prototypes for tools to create simulated radio sky images based on

the Global-Sky-Model database and make wide-field image mosaics have also been produced. The Surveys KSP team has also been studying the effects of the ionosphere on LOFAR observations. A first ionospheric model (based on Intema's PhD work - see below) has been developed and is in the process of being incorporated into the standard LOFAR software pipeline.

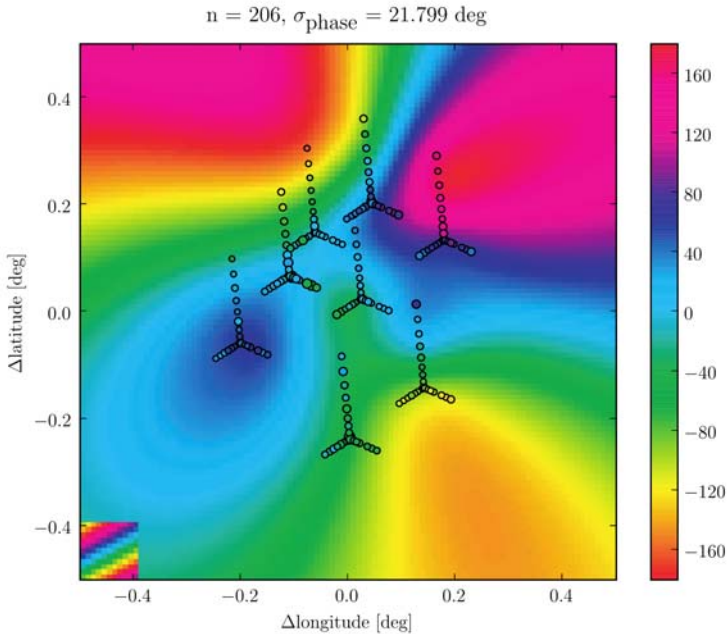


Figure 15: Example of an ionospheric phase screen model fit. The color map represents an ionospheric phase screen at 200 km altitude that was fitted to the phase solutions of eight calibrator sources at time-interval $n = 206$ of 10 seconds during a VLSS observing run of the 74 MHz VLA in BnA-configuration. The axes represent angular distances as seen from the center of the Earth, relative to the phase screen's pierce point along the line-of-sight from array center to pointing center, with East- and Northward offsets being positive. The overall phase gradient (depicted in the bottom-left corner) was removed to make the higher order terms more clearly visible. The collection of pierce points from all array antennas to all peeling sources are depicted as small circles. The color in the circle represents the measured peeling phase. The size of the circle scales with the magnitude of the estimated phase residual after model correction.

Ionospheric phase errors are one of the most limiting factors for existing and new high-resolution, low-frequency radio telescopes like LOFAR, LWA, EVLA and GMRT. Intema developed, in collaboration with van der Tol (Delft, NL), Cotton (Charlottesville, USA), Cohen (NRL, USA), van Bommel and Röttgering

(Leiden), a new calibration method for the suppression of direction-dependent ionospheric phase errors in wide-field, low-frequency (below ~ 300 MHz) radio interferometric observations. The method measures a discrete number of ionospheric phase errors by calibrating on individual bright sources in the field-of-view (peeling technique). It interpolates the calibration results towards arbitrary viewing directions by fitting a quasi-physical ionospheric model. Initial tests on several VLA 74 MHz data sets demonstrated a significant improvement in image quality as compared to the previously existing self-calibration and field-based calibration techniques. A reduction of the sidelobe noise by ten to forty per cent, combined with an increase in source peak flux by ten to twentyfive per cent results in a dynamic range improvement by fifty to a hundred per cent. Furthermore, reduction of the sidelobe noise significantly reduces the number of false source detection at the five-sigma level.

8.3 Instrumentation

MATISSE: mid-infrared VLTI spectrometry

Jaffe is the Dutch PI for the mid-infrared, spectro-interferometric instrument (MATISSE), which has been accepted as a 2nd generation VLTI instrument by ESO. The Cold Optical Bench for MATISSE will be built in Dwingeloo. Jaffe is on the Science Team and the Instrument team with special responsibility for real-time data processing and polarization characterisation. MATISSE should be mounted on the VLT at Paranal (Chile) in 2014.

MUSE and ASSIST

The Multi-Unit Spectroscopic Explorer (MUSE) is a 2nd generation instrument designed for use on the VLT. It features Wide-Field, Adaptive Optics Assisted Integral Field Spectroscopy. MUSE is currently in its final design phase and its team is preparing for a Final Design Review in early 2009. The MUSE consortium currently comprises seven institutes, led by the Observatory of Lyon. The Dutch national research school (Toponderzoekschool) NOVA is, represented by Leiden Observatory, primarily involved in the interface of MUSE and its Adaptive Optics system (GALACSI), the preparation for scientific operation (ETC and Operation, Calibration of MUSE) and the MUSE observation template effort.

The Adaptive Secondary Setup and Instrument STimulator (ASSIST) is the test system for the VLT Adaptive Optics Facility (AOF) and it will allow verification of the operation of the various hardware and software systems for the AOF without the need for burdensome on-the-sky testing. ASSIST, designed by

Deep, Hallibert, Jolissaint, Kendrew, Stuik and Wiegiers is preparing for the Final Design Review, expected to take place in March 2009.

MICADO: a near-IR wide-field imager for the ELT

As Dutch PI for the MCAO Imaging Camera for Deep Observations (MICADO), Kuijken was involved in one of the ESO Extremely Large Telescope (ELT) instrument-design studies. The instrument is meant to provide diffraction-limited imaging behind the multi-conjugate adaptive-optics focus of the ELT, over a wide field of between 30 and 60 arcsec. It operates at near-IR wavelengths, from 0.8 to 2.5 micron.

Franx, Kuijken and Tolstoy (Groningen, NL) contributed to the science case for the instrument, and Droste and Navarro (Dwingeloo, NL) took part in the design work, specifically the mechanical and cryogenic aspects. The instrument is of interest as a potential first-light instrument, with interesting applications in high-precision astrometry (dynamics of the galactic center and globular clusters, and dwarf spheroidal galaxies), resolved stellar population studies and imaging of high-redshift galaxies. The study is due to report to ESO at the end of 2009.

METIS: Instrumentation for the ELT

The ELT, an 42m optical/infrared telescope, will be ESO's most challenging project for the next decade. Several conceptual (phase A) studies for scientific instruments for the ELT have started in 2008. Brandl is the Principal Investigator for METIS, the Mid-infrared ELT Imager and Spectrograph. The Dutch-led project is performed by an international consortium, including institutes in Germany, France, Belgium and the UK. The work includes contributions from Molster, Stuik and Kendrew in Leiden and from many people at ASTRON. For more information see <http://www.strw.leidenuniv.nl/metis/>

8.4 Space

GAIA

The Leiden Gaia group, led by Brown, is involved in the preparations for the data processing for ESA's Gaia mission. Scheduled for launch in 2011, Gaia aims at providing a stereoscopic census of the Milky Way galaxy by measuring highly accurate astrometry (positions, parallaxes and proper motions), photometry and radial velocities for 1 billion stars and other objects to 20th magnitude. The group's main activities in 2008 were:

Brown, Busso, and Marrese continued their work on the development of the data processing software for the photometric instrument of Gaia in collaboration

with groups in Italy (Rome, Teramo), the UK (Cambridge), and Spain (Barcelona). The photometric data for Gaia will be collected through low dispersion spectrophotometry with prisms and the group in Leiden is responsible for developing the algorithms that extract the spectra from the raw data. Busso and Marrese developed a first version of the code that evaluates the crowding conditions in dense stellar fields and they also further developed the corresponding code that takes care of the disentangling of the spectra. In addition modules for isolated stars were developed. The software was delivered to the group in Cambridge where everything will be integrated into the photometric processing pipeline for testing on simulated data.

Marrese and Brown developed a robust description of the shape of the prism spectra which can be used as colour-like parameters in the Gaia data processing. These are important especially for correctly handling the chromaticity effects in the astrometry.

A major concern for the Gaia mission is the effect of radiation damage to the CCDs (due to Solar wind and cosmic ray protons). The consequence will be an increased level of charge transfer inefficiency which will cause a loss of signal as well as a distortion of the image. The latter will cause systematic errors in the astrometry if not carefully controlled. In this context Prod'homme is doing his PhD research on the theoretical and empirical modelling of radiation damage effects. During 2008 he completed the development of a platform called CEMGA (CTI Effects Model for Gaia) which reproduces in detail the CCD operations for Gaia. This platform can handle a variety of models, of which two are already implemented, a fast analytical model and a very detailed Monte Carlo model. The results of the models have been validated against experimental data from real Gaia CCDs, measured by EADS-Astrium.

In order for Gaia to reach its astrometric accuracy goals the highest quality for the attitude knowledge of the spacecraft is needed. It is thus important to incorporate a complete physical understanding of the dynamics of a continuously rotating space platform into the attitude modelling for Gaia. In this context Riquez is developing detailed simulations of Gaia's attitude, incorporating all of the relevant physical effects. This model is developed in collaboration with van Leeuwen and Keil (Cambridge, UK). Riquez has finished the module that simulates the expected torque acting on the Gaia satellite due to solar photons.

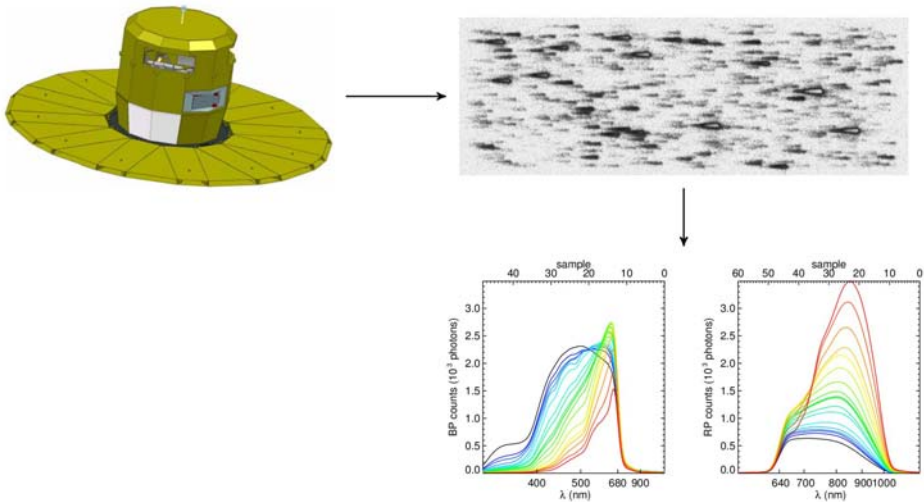


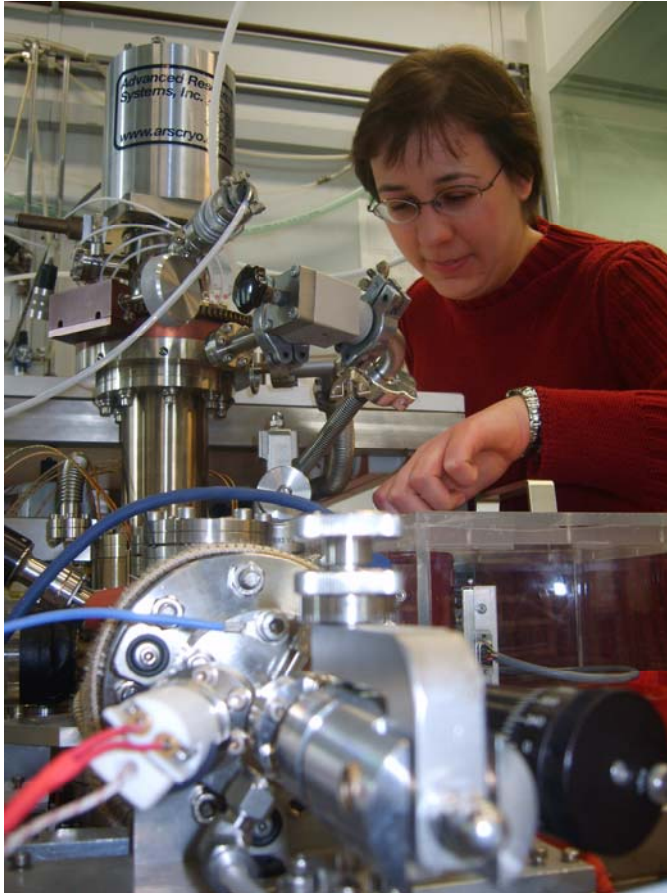
Figure 16: The top right image is a simulation of a crowded stellar field as observed by the photometric instruments on board the Gaia spacecraft (left). These overlapping dispersed images have to be disentangled into one dimensional Blue Photometer (BP) and Red Photometer (RP) spectra. Simulated versions of the latter are shown in the bottom right image. The two panels show BP (left) and RP (right) spectra for a range of main sequence stars (O5 to M5). From these spectra all sources observed by Gaia can be classified and parametrized in terms of astrophysical parameters.

Wavelength calibration for JWST-MIRI

The Mid Infrared Instrument (MIRI) will provide the James Webb Space Telescope (JWST) with medium ($R \sim 3000$) resolution integral field unit (IFU) spectroscopic capabilities in the range from 5 micron to 28 microns. A good calibration of the instrument on the ground is essential to ensure high quality data early after launch. Martinez-Galarza, together with Kendrew and Brandl, has been working on the wavelength calibration and resolving power of the instrument using data obtained during tests at the Rutherford Appleton Labs. The results show a good agreement with the model predictions. In addition, software tools for spectral extraction have been also developed by Lahuis (SRON) and Martinez-Galarza.

9. Raymond and Beverly Sackler Laboratory

The work in the Sackler laboratory for Astrophysics provides information needed to interpret and guide astronomical observations and as input for astrochemical models. In 2008, 'water in space' has been a research focus.



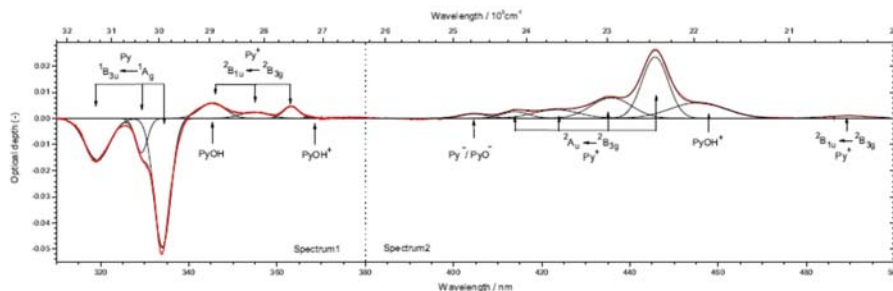
The making of water

Even though water is the main constituent in interstellar icy mantles, its chemical origin is not well understood. The team around SURFRESIDE (Ioppolo, Romanzin and Cuppen) succeeded in studying hydrogenation reactions of oxygen ice. For this purpose O_2 ice is bombarded by H or D atoms under ultra-

high vacuum conditions at astronomically relevant temperatures ranging from 12 to 28 K, close to the desorption temperature of O₂. With both spectroscopic and mass spectrometric methods it was possible to show that O₂ efficiently converts into H₂O via hydrogen peroxide, H₂O₂, with a rate that is surprisingly temperature independent. It should therefore be considered as a relevant channel for interstellar water ice formation.

Reactions with water

The team around CESSS (Bouwman, Allamandola, Paardekooper, and Cuppen) was able to study the photo physical and photo chemical processes induced by VUV irradiation of PAHs trapped in water ice. Using an incoherent broad band direct absorption optical technique, spectroscopic information was obtained that reflects a varied and rich chemistry in water ice at astronomically relevant temperatures. This is demonstrated in the figure where a typical baseline corrected spectrum is shown after 1200 seconds of VUV irradiation of a 1:10000 diluted pyrene: H₂O ice mixture at 10 K. The negative signals indicate destruction (the pyrene starts reacting away), the positive signals show the reactants. These show that also the water is involved in the reaction scheme.



The dissociation and desorption of water

At the high densities and low temperatures prevalent during most stages of star formation, freeze-out of gas-phase molecules onto interstellar dust particles is fast and hence no gas is expected at detectable levels toward such objects. Yet astronomical observations of star forming regions have revealed significant abundances of cold molecular gas. This can only be understood in the light of an efficient non-thermal ice desorption mechanism. Employing the ultra-high vacuum set-up CRYOPAD Oberg has experimentally simulated the VUV induced photodesorption of the most abundant ices observed in space: CO, CO₂ and particularly H₂O. These ices have all high photodesorption yields around

10^{-3} per VUV photon. The photodesorption mechanisms were constrained through extensive parameter searches within the experimental set-up and were found to be fundamentally different for CO on one hand and CO₂ and H₂O on the other. The latter exhibit dissociation (eg. OH + H) and photodesorption behaviour that is in full agreement with the PAH chemistry observed in the ice. The understood dependencies of these yields on physical conditions allow for the incorporation of photodesorption into astrochemical models. Such models have now revealed that photodesorption plays a large role in determining the gas phase abundances of different molecules in cold and dense regions, such as protostellar envelopes and protoplanetary disks.

Photodesorption of water ice: a molecular dynamics study

Absorption of UV radiation by water ice may lead to dissociation and desorption of the ice molecules, a process thought to be important in the gas-grain chemistry of clouds and disks. Andersson and van Dishoeck computed photodesorption efficiencies of amorphous water ice using a classical molecular dynamics method and elucidated the mechanisms by which desorption occurs. The probability for H₂O desorption per absorbed UV photon is found to be 0.5-1 per cent in the top three monolayers, then decreases to 0.03 per cent in the next two monolayers, and is negligible deeper into the ice. The main H₂O removal mechanism is through separate desorption of H and OH fragments. The probability of any removal of H₂O per incident photon is estimated to be about 0.04 per cent, within a factor of two of values found by Oberg and colleagues in laboratory experiments.

Photodissociation and small carbonaceous molecules in PDRs

Van Dishoeck and van Hemert (ULeiden Chemistry Dept.) have carried out ab initio quantum-chemical calculations of the vertical excitation energies, transition dipole moments and oscillator strengths for a number of astrophysically relevant carbonaceous molecules: C₃, C₄, C₂H, 1- and c-C₃H, 1- and c-C₃H₂, HC₃H, 1-C₄H and 1-C₅H. They used these data to calculate photodissociation rates in the unattenuated interstellar radiation field by assuming that all absorptions above the dissociation limit lead to dissociation. The resulting rates are large, typically an order of magnitude more rapid than found for other small hydrides. This implies that the small carbonaceous molecules observed in photon-dominated regions most likely result from fragmentation of larger molecules rather than synthesis from smaller species.

Molecule formation on interstellar grains

Many important molecules such as H_2 , H_2O and CH_3OH do not have efficient gas phase formation routes under the cold, dilute conditions of the interstellar medium. Instead, they form on the surfaces of dust. The chemical networks which include the intermediate species as well as the role of the surface are still unclear in most cases. Laboratory experiments are a powerful way to explore the chemical reactions that can lead to abundant interstellar molecules in a well-defined and controllable environment. However, the results of these experiments are not always straightforward to interpret and they are performed under pressures and fluxes which are several orders of magnitude away from interstellar conditions. Monte Carlo simulations are a tool to both help with the interpretation by disentangling different formation mechanisms and with the extrapolation to interstellar conditions. Cuppen successfully used such simulations to model the formation of H_2 , H_2O and CH_3OH over a range of different temperatures and pressures, both under laboratory and interstellar conditions.

She found a good example to be the formation of H_2 in relatively warm regions like PDRs and shocks. Monte Carlo simulations showed that only by the introduction of a mechanism that was not considered before, experimental results from two different laboratories could be explained. This has implications for H_2 in PDRs and shocks, since this new mechanism increases the regime in which H_2 is formed.

Chapter

3

Education,
popularization
and social events

Sterrewacht
Leiden

Education, popularization and social events

Chapter 3

3.1. Education

3.1.1. Organisation

Education and training of students is a major priority of Leiden Observatory. In 2007, 27 freshmen started their studies in astronomy., The total number of students registered at the Observatory was 127, including Bachelors, Masters, and Old-style Doctoral Students. Several students from Delft Technical University (from the applied physics department) took courses of the Leiden astronomy curriculum as part of the requirements for a minor in astronomy. Twelve students passed their propedeutical exam, and 7 students took their BSc exam.

Three staff members acted (part-time) as study advisers. Hogerheijde took over from Snellen as the freshman-student adviser. Snellen remained as coordinator of the various activities directed at secondary school students, such as pre-university college and LappTop courses, open days, guest lectures etc. Linnartz was study adviser for the remainder of the Bachelor programme, while Röttgering acted as master-programme study advisor. Oosthoek was hired as a badly needed education coordinator to take care of the daily running of tasks.

In addition to regular counseling by the student advisor, incoming students were assigned to small groups meeting at regular intervals with a staff mentor (Schaye and Linnartz) and a student mentor. In the tutor program, the majority

of physics and astronomy freshman students are provided, on a voluntary but regular basis, with coaching by senior students.

As part of the introductory astronomy course, students were taken to the Artis Planetarium in Amsterdam for a lesson in coordinate systems, time and constellations in the sky (Hoekstra). As part of the second-year training in practical astronomy, 12 honors students were offered the opportunity to take part in a specially arranged observing trip to the Isaac-Newton-Telescope on La Palma, Canary Islands (Snellen, Le Poole).

The parallel course Analysis 3NA, provided by the mathematics department at the specific request of both astronomy and physics, was very successful. In this course, (astro)physical applications of the mathematical tools are emphasized more than in the regular course which emphasizes mathematical rigour. Unlike the regular course Analysis 3, this parallel course does not prepare for Analysis 4.

At the end of the year, there were 5 old-style 'doctoraal' students and 20 master students, nine of them from outside The Netherlands. In 2008, 9 students began their master study, whereas 9 students obtained their master's degree and 7 students their 'doctoraal' degree. All master students now have their individually tailored study plan.

The astronomy curriculum is monitored by the 'Opleidingscommissie' (education committee), which advises the Director of Education on all relevant matters, and which was chaired by Van der Werf. Other members are Icke, Schaye, Intema and Damen, as well as de Valk, van den Broek, Straatman, Langelaan and Pijloo representing the student body. Under the authority of the Opleidingscommissie, the lecture course monitoring system (SRS) was continued. In this system, students provide feedback to lecturers during and after the course.

The quality of curriculum and exams is guarded by the 'Examencommissie' (Exam Committee) chaired by Lub and with Israel, Aarts (physics), Snellen and Van der Werf as members.

Admission to the master-curriculum for students without a BSc in astronomy from a Netherlands university requires a recommendation by the Toelatingscommissie (admissions committee) chaired by Schaye and having Israel and Linnartz as members.

3.2. Degrees awarded in 2008

3.2.1. Ph.D. degrees

A total of seven graduate students successfully defended their Ph.D. theses in 2008 and were duly awarded their Ph. D. degree: They are:

Name: Cyril Tasse
Titel thesis: Host galaxies and environment of active galactic nuclei
Promotor: George Miley
Co-promotor Peter Katgert

Name: Dominic Schnitzeler
Titel thesis: Faraday tomography of the galactic ISM with the WSRT
Promotor: George Miley, Get de Bruin
Co-promotor Paul van der Werf

Naam: Lottie van Starkeburg
Titel thesis: Dynamics of high redshift disk galaxies
Promotor: Marijn Franx
Co-promotor;; Paul van der Werf

Name: Remco van den Bosch
Titel thesis: Giant elliptical galaxies
Promotor: Tim de Zeeuw

Name: Christian Brinch
Titel thesis: The evolving velocity field around protostarts
Promotor: Ewine van Dishoeck
Co-promotor: Michiel Hogerheijde

Name: Tim van Kempen
Titel thesis: Probing Protostars

Promotor: Ewine van Dishoeck
Co-promotor: Michiel Hogerheijde

Name: Simon Albrecht
Titel thesis: Stars and planets at high spatial and spectral resolution

Promotor: Andreas Quirrenbach
Co-promotor: Ignas Snellen

3.2.2. Master's degrees (Doctoraal diploma's)

The following 16 students were awarded Master's/Doctoral degrees in 2008:

Name	Date	Present Position
Susan Brown	Feb 26	Ortec Logistics
Patrick Herfst	Feb 27	Journalistiek
Pascal Baars	Mar 25	Ortec Finance
Freeke van de Voort	Mar 25	Ph.D. Leiden Observatory
Marten Hamelink	Mar 25	Trainee Rijksoverheid
Reinier Tan	Mar 25	TNO-Defensie
George van Hal	June 24	Wetenschapsjournalist
Hester Schouten	June 24	Gemeente Den Haag Finance/Control
Martijn van Riet	Aug 26	TNO-Space
Silvia Toonen	Aug 26	Ph.D. Radboud U., Nijmegen
Akila Jeesson Daniel	Aug 26	Ph.D. Munchen, Germany
Hugo Zeballos Pintos	Aug 26	Returned to Chile
Stephanie Prianto Rusli	Aug 26	Ph. D. Munchen, Germany
Liviu Stirbat	Aug 26	Assistant, EU Parliament, Brussels
Tri Astraatmadja	Aug 26	Ph. D. Univ. of Amsterdam
Evelyn Caris alias Reynders	Nov 25	Ph. D. Swinburn U, Melbourne, Australia

3.2.3. Bachelor's degrees

A total of 7 students obtained their Bachelor's degree:

Name	Date
Ilja Rosenbrand	Mar 13
Wouter Schrier	Mar 28
Aleksandar Shulevski	June 17
Sander de Kievit	July 1
Marcel van Daalen	July 13
Renske Smit	September 4
Arjon Severijnen	December 12

3.3 Courses and teaching

3.3.1. Courses taught by Observatory curriculum staff 2008 - 2009

Elementary courses:

Semester	Course title	Teacher
1	Introduction astrophysics	F.P. Israel
2	Astronomy lab 1	P.P. van der Werf
3	Stars	A.C.A. Brown
3	Modern astronomical research	H.V.J. Linnartz
4	Astronomy lab 2	I. Snellen
5	Observational techniques 1	R.S. Le Poole
5	Radiative processes	M.R. Hogerheijde
5-6	Bachelor research project	W.J. Jaffe
6	Introduction observatory	E.R. Deul

Advanced Courses (Keuzevakken; semesters 7, 8, 9, 10):

Stellar structure and evolution	J. Lub
Astrochemistry	E. F. van Dishoeck
Active galaxy nuclei	H.J.A. Röttgering
Cosmology	V. Icke
Detection of Light	B. Brandl
Spacebased Astronomy	R.S. Le Poole/Th. de Graauw
Stellar Dynamics	C. Hopman
Computational Dynamics	V. Icke
Adaptive Optics	L. Jolissaint

Pre University Program

LAPP-Top, the Leiden Advanced Pre-University Program for Top Students, is aimed at enthusiastic and ambitious 5th and 6th grade high-school students.

Candidates are selected on the basis of their high-school performances and their

enthusiasm to participate. The LAPP-Top students have taken part in 8 meetings from January till May, following the program of their own choice.

The Sterrewacht has been participating in the LAPP-TOP program since its start in 2001. In that pilot year five students participated, in 2002/3 six, in 2003/4 eleven, in 2004/5 thirty-three, in 2005/6 seventeen, in 2006/7 twenty seven, in 2007/8 sixteen and in 2008/9 twenty.

The astronomy LAPP-TOP program was developed by van der Werf from 2002 onward. From 2005-2008 the project was coordinated by Snellen. Since 2008 it is coordinated by Franx. In eight sessions the following subjects were treated:

Extrasolar planets - I. Snellen
 The Milky Way and other galaxies - J. Schaye
 Practicum: distances in the Universe
 Gas and Radiation - V. Icke
 Quasars, black holes and active galactic nuclei - H. Röttgering
 Practicum: The black hole in the center of our Milky Way
 Cosmology - P. Katgert
 Excursion to the radio telescopes in Westerbork and Dwingeloo

After successfully completing the program participants have been awarded with a certificate from the University of Leiden. High-school students are allowed to use this project as part of their final exams.

Other Courses:

Date	Speaker (affiliation)	Title
Sep 26	F.H. van Lunteren (Universiteit Leiden, Netherlands)	<i>Natuurkunde als vakgebied: ontstaan, ontwikkeling en toekomst (College Fysica en Samenleving)</i>
Oct 31	F.H. van Lunteren (Universiteit Leiden, Netherlands)	<i>Quantummechanica en Weimarcultuur (College Fysica en Samenleving)</i>

3.4. Popularization and Media Contacts

3.4.1. Public Lectures and Media Interviews

Bouwman

'Astronomy in the ruimte en in het laboratorium' (Haagse Hogeschool, Den Haag)

Brinchmann

'Weighing and measuring galaxies', Nov 18

Brandl

'The Science and Technology of the James Webb Space Telescope' (Colombian Astronomical Network, Pererira, Colombia, Aug 20)

Brown

'Gaia - Een stereoscopische kaart van de Melkweg' (KNVWS Overveen, Jan 17)

Idem (KNVWS Delft, Jan 22)

Idem (KNVWS Den Helder, Mar 21)

Idem (KNVWS Putten, Mar 31)

Idem (KNVWS Almere, Apr 22)

Idem (KNVWS Eefde, Nov 13)

Idem (KNVWS Amsterdam, Nov 25)

Idem (KNVWS Hilversum, Dec 12)

Idem (KNVWS Leiden, Dec 16)

Cuppen

'Information event for high school girls through VHTO' (Vlaardingen, Nov 25)

van Delft

'Dirk van Delft wil collecties verrijken door samenwerking' (interview Academische Nieuwsbrief; Feb 19)

'Instrument om verre te sien' (interview Volkskrant; March 8)

Radio interview (OVT Hilversum; March 23)

'Museum Boerhaave en Eoenbeeld: een prikkelende samenwerking' (Evenbeeld Angerlo; March 26)

Radio interview (Desmet Live Amsterdam; April 1)

'Vloeibaar helium en de Big Science van Heike Kamerlingh Onnes' (Natuurkundig Gezelschap te Leiden; May 16)

- 'Nut en noodzaak van wetenschap in musea' (ICOM Nederland Amsterdam; May 19)
- 'Wie was Heike Kamerlingh Onnes' (NVvK, uitreiking Kamerlingh Onnes Medaille Leiden; May 21)
- 'Kranenvet en kwartsdraad. Wetenschap, techniek en samenleving in het museum' (Stichting Academisch Erfgoed Delft; May 27)
- 'Preventing Theft. The Kamerlingh Onnes Laboratory during World War II' (Excursion Instituut Lorentz Leiden; June 13)
- 'Ehrenfest letters surface' (interview Physics Today; June)
- 'Wie was Heike Kamerlingh Onnes' (Leids Volkshuis Leiden; June 22)
- Radio interview (Tros Nieuwsshow Hilversum; July 5)
- 'Buffelen voor eem theekopje helium' (interview Volkskrant; July 5)
- 'Een familie in kou en kunst' (interview Leids Dagblad; July 5)
- Radio interview (VRT Brussel; July 9)
- Radio interview (Met het oog op morgen Hilversum; July 9)
- Openingstoespraak tentoonstelling 'Jacht op het absolute nulpunt' (Museum Boerhaave Leiden; July 10)
- 'Kalt und Kostbar' (interview Physik-Journal; July)
- TV interview (NOS journaal; July 13)
- 'De blauwe jongens. Heike Kamerlingh Onnes en de Leidse Instrumentmakers School' (LIS Leiden; July 16)
- 'Quest for Absolute Zero, or how Museum Boerhaave tries to tell a story about cold' (TU Delft; Sept 9)
- 'Wie was Heike Kamerlingh Onnes?' (Museum Boerhaave Leiden; Sept 10)
- 'Heike Kamerlingh Onnes en de Nederlandse Vereniging voor Koude' (NVvK Arnhem; Sept 23)
- 'Jacht op het absolute nulpunt' (Studium Generale Leiden; Oct 8)
- 'Temperatuur en thermometers' (HOVO lecture, Leiden; Oct 22)
- 'Dat mag in de krant!' (Fysica & samenleving, Leiden; Oct 24)
- 'Wie was Heike Kamerlingh Onnes?' (Vereniging van Oud-Sterrewachters Leiden; Oct 25)
- 'Wie was Heike Kamerlingh Onnes?' (Rotary Holiday Inn Leiden; Nov 3)
- 'De Leidse cascade' (HOVO lecture Leiden; Nov 5)
- 'Waterstof en helium' (HOVO lecture Leiden; Nov 12)
- 'Einstein in Leiden, Debye in Berlijn' (Cleveringalezing Nice; Nov 21)
- 'Koude & kunst en het museum' (HOVO lecture Leiden; Nov 26)
- 'Nut en noodzaak van wetenschap in een museum' (Fysica & Samenleving Leiden; Nov 28)
- 'Toepassingen', (HOVO lecture Leiden; Dec 10)
- 'Salon 'Boerhaave wordt salonfähig'(interview Volkskrant; Dec 13)

'Salon Boerhaave wil 'huiskamer' zijn voor wetenschapshistorici' (interview Academische Nieuwsbrief; Dec 16)

'Heike Kamerlingh Onnes and the Second Dutch Golden Age' (Nederlands Instituut Sint-Petersburg; Dec 17)

Van Dishoeck

'Van moleculen tot planeten (Societeit voor culturele samenwerking, Nieuwspoort' (Den Haag; March 3)

'Spitzer, ALMA en de toekomst van de infrarood telescoop (Boerhaave museum' (Leiden; March 5)

'Moleculen bouwen in het heelal: fatal attraction onder extreme condities' (PAC Symposium, VU, Amsterdam)

'Oorsprong van ons zonnestelsel' (Olympiade, Utrecht; June 4)

'Astrochemistry' (interview ScienceWatch; April 2008)

'Water in the Universe' (Interview Euronews Space Magazine tv special; May 2008)

'Foreign Honorary Member AAA&S' (Interview Leiden University press release; June 2008)

'Dit geeft bredere kijk op leven' (Interview Mare; June 19 2008)

'Water in the Universe' (ESA educational movie/DVD for high schools; September 2008)

'Ogen in de ruimte' (National Geographic, p. 36-45; October 2008)

Ruimtetelescopen zijn onmisbaar (Economische Zaken brochure; October 2008)

De ruimte als reageerbuis (Natuur, wetenschap & techniek, p.41-44; October 2008)

Leermeesters en leerlingen (KNAW tentoonstelling; November 2008)

Haas

"Stervorming: clusters of losse sterren?" KNVWS lezing, Leiden; Nov 25

Hopman

Article on LISA for "Eureka!" (magazine of the science faculty of Leiden University).

Israel

Sputnik 50 Jaar Later (Pre-University College, Leiden; 7 April)

Sputnik 50 Jaar Later (V-OS, Leiden; 17 Mei)

De Nieuwe Leidsche Sterrewacht (Museum Boerhaave, Leiden; 10 Juni)

van Langevelde

Radio-astronomy, a telescope larger than Europe at EC even "GEANT, a global leader", Bled, Slovenia; Mar 4

Een telescoop zo groot als Europa public lecture, Middelburg; Jun 27

VLBI, e-VLBI and astronomy, visit journalists VWN, JIVE Dwingeloo; Oct 1

JIVE, een telescoop zo groot als Europa STRON/JIVE open dag, Dwingeloo; Oct 19

Linnartz

Observatory representative press releases. Press releases 2008:

Astronomisch trio breekt submillimeter record

Astronomen ontwikkelen groeicurve voor ster-embryo's

Zonnebaden rondom jonge sterren

Astronoom Ivo Labbe wint de eerste van Marum prijs

Astronomen zien planeten in gas rond jonge sterren

Marijn Franx gaat vroegste sterrenstelsels bekijken

Subsidie voor behoud Leids Sterrewacht archief

Leidse astronomen zien dampkring exoplaneet vanaf de Aarde

Babystelsels gaan gebukt onder overgewicht.

Natuur, Wetenschap & Techniek, De ruimte als reageerbuis (Oct issue)

Lommen

Presentation "Machten van tien" for a group of 50 first-year highschool students (Mar 4)

Presentation "Stervende sterren" for a group of 94 fifth- and sixth-year highschool students (Mar 6)

Presentation "Machten van tien" for a group of 10 highschool teachers (May 13)

Lecture "Afstanden in de ruimte" for fifth- and sixth-year highschool students (Nov 21)

van Lunteren

Sterren kijken achter de dijken: 400 jaar sterrenkunde in Nederland', Vereniging Sacculina (Leiden; Feb 6)

'De tragikomische geschiedenis van de meter', Vereniging van Oud-Sterrewachters (Leiden; May 17)

'Tweehonderd jaar Nederlandse sterrenkunde', opening tentoonstelling 'Van ver-siende bril tot radiotelescoop', UB Leiden (Leiden; Sep 15)

'Kaiser als popularisator', Leidse Weer en Sterrenkundige Kring (Leiden; Sep 30)

'Nederland, de Meter en het Internationale Bureau voor Maten en Gewichten', donateursdag De Hollandse Cirkel (Den Haag; Oct 9)

Organisatie expositie in UB over de geschiedenis van de telescoop met nadruk op de Leidse sterrenkunde Radio-interview over Teylers Museum voor Verre Verwanten
Teleac Radio, uitzending 7 juni
Medewerking Film over Buys Ballot, t.b.v. Universiteitsmuseum Utrecht

Martinez Galarza

The Science and Technology of the James Webb Space Telescope (Colombian Astronomical Network, Pererira, Colombia; Aug 20)

Snellen

Leidse astronomen zien dampkring exoplaneet vanaf de aarde (20 mei) (press release)
"Exoplaneten en de ontdekking van nieuwe werelden" Symposium NNGC, Leiden; 28 Maart
"Extrasolaire Planeten" AWSV Metius, Alkmaar; Sept 26.
Students Discover Unique Planet (4 Dec) (press release)
Also a handful of school-visits.

Wehres

The Interstellar Medium - Spectroscopy in Space and Laboratory, for visiting students King's College London, Leiden; Oct 20.

Weijmans

Donkere materie: duisternis in het heelal, KNVWS Zwolle; Jan 17
idem, KNVWS Venlo; March 28
idem, KNVWS Zutphen; Sep 18
Donkere materie in sterrenstelsels, KNVWS 't Gooi; Sep 19

vd Voort

Talk at the old observatory: "Stars and galaxies" (Oct. 21)

3.4.3

Tours at the Old Observatory: In february 2008, Saskia van den Broek took over the organization of tours at the Old Observatory from Freeke van der Voort. In 2008 students and promovendi have given about 20 tours at the Old Observatory. Half of these tours have been given to highschoools, each for 25 to 90 pupils. Furthermore tours have been given to scouts, children's birthday parties, and small groups of interested people. Tours include a presentation on astronomy, usually the "Powers of 10", and a visit to two telescopes. The history and concepts of telescopes are explained, and in case of good weather, visitors can observe the Moon and planets.

For children up to 12 years a new presentation has been developed. During a "yes/no-quiz" questions on astronomy are asked to the children, who have to sit down in a square on the floor with yes or no in it. In this way the children learn about astronomy in a funny and entertaining manner, which keeps their attention. This kind of presentation turned out to be a great success for small children.)

3.5 Universe Awareness Program

Odman, Miley and S. Levin continued their work on the Universe Awareness programme.

Universe Awareness (UNAWA) is an international programme instigated by Miley to expose underprivileged young children aged from 4 to 10 years to the inspirational aspects of astronomy. By raising awareness about the scale and beauty of the Universe, UNAWA attempts to broaden the mind and awaken curiosity in science, at a formative age when the value system of children is developing. A goal of UNAWA is to stimulate their development into curious, tolerant and internationally minded adults.

Since its initiation by Miley in 2004, UNAWA has grown from a concept to a thriving network of more than 150 UNAWA volunteers and experts active in 17 partner countries worldwide. Some important achievements of UNAWA during 2008 were:

- (i) The addition of several new partner countries to the programme
- (ii) The organization of many international UNAWA events for young children
- (iii) Preparation for UNAWA as a global cornerstone programme of the UN-designated International Year of Astronomy in 2009
- (iv) Development of a range of international UNAWA materials and activities, instigation of a
- (v) sustained development of new materials
- (vi) Lobbying for acquisition of EU funding

3.6 The Leidsch Astronomisch Dispuut 'F. Kaiser'

Kaiser started the year with a board change. The new members of the board are: Jesse van de Sande, Saskia van den Broek, Gilles Otten and Tri Laksmana Astraatmadja. Starting off all bright and shiny, the movie Sunshine was shown. And although most of the board members are Dutch, there was a free dinner as well.

To prove to the universe we had a darker side, observing nights were organised. This initiative was taken, because a lot of the astronomy students have no basic observing skills. Despite the fact that they took telescope introduction. Under the supervision of our highly trained observing team, people were taught the basics of telescopes one on one. Unfortunately the weather was less than supportive, but we are certain that 2009 cannot possibly be any worse.

In 2008 we also celebrated the 200th birthday of our all time favourite astronomer F. Kaiser, by organising the annual barbeque (again for free!). There was a huge turn-up, which may also have been due to our promise to show the European championships soccer match Holland-France (4-1) on a large screen. The promise of free drinks might also have helped.

In an attempt to prove that time travel is indeed possible, Kaiser crossed a line by showing the movie Donnie Darko. As we are still convinced of the possibility of time travel, we will try to prove this again in 2009 with yet another movie. In September Kaiser said goodbye to Tri, but welcomed Alireza Rahmati to it's inner circle. With the chair away in November, Kaiser's inner youth emerged and the movie Wall-E was shown. Although the Old Observatory will go into renovation in the beginning of 2009, we still hope to organise all sort of activities throughout the year.

3.7 Vereniging van Oud-Sterrewachters

The 'Vereniging van Oud-Sterrewachters' (VO-S; <http://www.vo-s.nl/>) is the official association of Sterrewacht/Observatory (ex-)affiliates. It has been in existence for over 15 years now and has seen another active year. As usual, the 145 members were offered a variety of activities. The highpoint of the year was a succesful reunion held in may. This was an activity also open to non-members

as it was jointly organized with the institute. Later in the year the activities included a social drink prior to the Oort Lecture and an annual meeting. This year, the annual meeting was held in Leiden and involved, among others, a visit of Museum Boerhaave and the exhibition "The telescoop, 400 years". VO-S members also received a newsletters with Sterrewacht news and were offered an electronic member dictionary.



Appendix I

Observatory staff

December 31, 2008

Sterrewacht

Leiden

Observatory staff December 31, 2008

Appendix I

Names, e-mail addresses, room numbers, and telephone numbers of all current personnel can be found on the Sterrewacht website:

<http://www.strw.leidenuniv.nl/people>

Telephone extensions should always be preceded by (071) 527 ... (from inside The Netherlands) or by +31-71-527 ... (from abroad)

Full Professors:

E.F. van Dishoeck	K. Kuijken
M. Franx	G.K. Miley (0.0)
V. Icke	A.G.G.M. Tielens
F.P. Israel	P.T. de Zeeuw (0.0)

Full Professors by Special Appointments:

D. van Delft*	(Museum Boerhaave, Stichting tot beheer Museum Boerhaave)
M. Garrett	(ASTRON, Sterrewacht, Faculty W&N)
H. Linnartz	(Stichting Fysica, Vrije Universiteit Amsterdam)
F. van Lunteren	(UL (0.5)/VU (0.3), Teijler's Hoogleraar)
H.A. Quirrenbach	(Landessternwarte Heidelberg, Faculty W&N)

* Director Boerhaave Museum;

Associate Professors and Assistant Professors / Tenured Staff:

B.R. Brandl	J. Lub
A. Brown	R.S. Le Poole (0.0)
M. Hogerheijde	S. Portegies Zwart (0.0)
W.J. Jaffe	H.J.A. Röttgering
P. Katgert (0.0)	J. Schaye
H.J. van Langevelde (0.0)**	I.A.G. Snellen
Y. Levin (0.8)	R. Stuik (NOVA Muse)
H.Linnartz	P.P. van der Werf

NOVA office:

E. van Dishoeck	Science director
W.H.W.M. Boland	Managing director
T. Brouwer	financial controller (0.2)
K. Groen	management assistant (0.8)

Management Support and Secretaries:

J.C. Drost	A. van der Tang
K. Groen (0.2)	L. van der Veld
P. Oosthoek	B. de Kanter (voluntary)

Computer staff:

E.R. Deul	manager, computer group
D. J. Jansen	scientific programmer
T. Bot	programmer
A. Vos	programmer

Visiting Scientists:

S. Albrecht	R. Mathar
M.J. Betlem	M. Spaans (RUG)
P. Ehrenfreund (LIC)	R. Stark (NWO)
M. Jourdain de Muizon	D. Stinebring (Oberlin College, USA)
J.K. Katgert-Merkelijn	J.A. Stüwe

Emeriti:

A. Blaauw (also: Groningen)	R.S. Le Poole
W.B. Burton	G.K. Miley
A.M. van Genderen	A. Ollongren
H.J. Habing	C. Van Schooneveld
I. van Houten-Groeneveld	J. Tinbergen
K.Kwee	

** Staff, JIVE, Dwingeloo

Postdocs and Project Personnel:

R. Alexander	NWO	S. Kendrew	UL/NOVA
S. Anderson	NWO	L. Kristensen	UL
D. Baneke	Gratama-St.	A. Kospal	NWO-VIDI
I. van Bommel	UL, EU SKADS	P. Marrese	UL/NOVA-GAIA
C. Booth	NWO, EU-EXT	H. Masso-Gonzalez	NWO-Rubicon
G. Busso	UL/NOVA-GAIA	F. Molster	NWO (NOVA), detaching
H. Cuppen	NWO, VENI	C.J. Ödman	KNAW/UNAWWE
C. Dalla Vecchia	EU-EXT	M. Pandey	NWO, LOFAR
A. Deep	UL/NOVA	R. Quadri	UL/NOVA
E. Gaburov	NWO-VIDI	N.M. Ramanujam	NOVA, LOFAR
B. Groves	UL/NOVA	D. Rizquez-Oneca	EU-ELSA
N. Hatch	UL, KNAW	C. Romanzin	UL/NOVA
H. Hildebrandt	EU	T. Schrabback	NWO
J. Holt	NWO	D. Serre	UL/NOVA-MUSE
C. Hopman	NOW, VENI	O. Usov	UL, KVI
A. Johansen	NWO-VIDI	C.E. Vlahakis	NWO
L. Jolissaint	UL/NOVA	R. Williams	NWO

Ph.D. Students:

N. Amiri	12	O. Panic	3,5
J. Bast	3	A.H. Pawlik	5
P. Beirao	1	F. Petrignani	7
J. Bouwman	8	T. Prod'homme	5
Y. Cavecchi*	1,2	D. Raban	3
M. Damen	1,2	O. Rakic	3
M. Haas	1	H. Rampadarath	12
R. van Haasteren	3	D. Salter	1
M. van Hoven	1	D.M. Smit	3
H. Intema	2,6	M.H. Soto Vicencio	1
S. Ioppolo	2	K. Torstensson	12
K.M. Isokoski*	2	E.N. Taylor	3
C. Kruip	2	F. van de Voort*	3
E. Kuiper	3	E. van Uiter	1
D.J.P. Lommen	2	M. Velandier	5
A.M. Madigan*	3	L. Vermaas	2
J.R. Martinez Galarza	2	R. Visser	4
F. Maschietto	3	N. de Vries	1
E. Micelotta	1,5	R. van Weeren	1,6
E. de Mooij	1	N. Wehres	13
M. Mosleh*	5	A. Weijmans	3
K.I. Oberg	5	M. Weiss*	14
I. Oliveira	1,4	R. Wiersma	11
R. Oonk	1	U. Yildiz*	1
J.-P. Paardekooper	2		

Funding notes:

1. funded by Leiden University; 2. funding through NOVA program; 3. funded by NWO, via Leiden University; 4. funding from Spinoza award; 5. funding by EU; 6. funding from KNAW; 7. funding by SRON; 8. employed by FOM; 9. funded by NOVA2 OPTICON; 10. funded from VICI Quirrenbach; 11. funded from EU Excellence grant; 12. funded by JIVE - EU ESTRELA netwerk; 13, funded by Groningen - EU Molecular Universe Network; 14. funded by Teyler's Foundation.

* denotes employment for only part of the year - see section staff changes.

Senior Students (doct.):

B. van Dam	S. de Kievit
M. van den Berg	C.H. van der Sluis
N. ter Haar	

Msc Students:

S. van den Broek	A. Rahmati
R. van der Burg	J. van de Sande
M. van Daalen	C. Schonau
J.D. Delgado Diaz	W. Schrier
E. Fayolle	A. Shulevski
E.G. Gavardi	S. Shah
D. Harsono	R. Smit
T.D.J. Kindt	D. Szomoru
M.T.A.L. Lambrechts	C.H.M. de Valk
A.N.G. Mortier	F. Vuijsje
S.V. Nefs	

Bsc Students:

A. H. Bakker	S. Levie
K.A.J.B. Beemster	R.H.M. van Loo
B. Berwanger	M.J. Luitjens
T.C.N. Boekholt	N. van der Marel
Y.O. van Boheemen	M. Meijer
P.C.J. Bol	S. Metafuni
Y.H. Bonnema	T.W. Nak
N.A. Bremer	T.E. Nota
R.W.C. Buurman	V.C.M. Oomen
S.R. Chander	G.P.P.L. Otten
H. Chellaney	H.C. Overweg
S. Crezee	J.T. Pijloo
M.S. van Deen	S.D. van der Ploeg
G. van Doorn	W.M. de Pous
M.N. Drozdovskaya	E.D.M. Schreuders
I.A.D. Engelhardt	M.C. Segers
R.T. Feld	R. van der Smeede
J. Franse	S. Smeets
A.V. Freudenreich	J. Sprangers
J. Hanse	P. Stout
L.M. Harms	C.M.S. Straatman
S. Heeres	L.V. Swiers
R.C. Heinsbroek	R. Tatch
R.T.L. Herbonnet	F.P. Treurniet
S.D. Hiltmann	M. Uri
H.J. Hoeijmakers	P.G. vandevelde

M.L.R. van't Hoff
D. Huijser
J.G.J. Hulshof
I.C. Icke
M.P.H. Israel
O. Jaïbi
A. Karisli
A.E. Klaassens
J. Kloek
N.F. Kouwenhoven
M.L. van Kralingen
O.J. Landman
P.G.C. Langelaan
K. Lebbink
C.J.M. Lemmens

N.R. Verhart
S.H. Vlaar
J.A.T. Voorn
R.M.J. Vooy
A.W. de Vries
A.J. Vromans
I.A. Walstra
S. Weersma
M.R.J. Weterings
A.W.P. Wijnakker
N.N.D. Wisse
M.C. van Woerden
S.T. Zeegers
D. Zoetemelk

Staff changes in 2008:

Name (funded by)	start	end
S. Albrecht (NWO)		1-12-2008
S. Andersson (NWO)	1-5-2008	
D. Baneke (Gratama St.)	1-3-2008	
S. Bottinelli (NWO)		1-10-2008
B. Brandl (NOVA)		15-6-2008
B. Brandl (UL)	15-6-2008	
J. Brinchmann (UL)	1-1-2008	
A.G.A. Brown (NWO)		31-12-2008
A.G.A. Brown (UL)	1-1-2008	
R. van den Bosch (NWO)		1-9-2008
C. Brinch (EU,UL)		1-10-2008
G. Busso (NOVA-GAIA)	1-5-2008	
Y. Cavecchi (NOVA, UL)	1-1-2008	
G. Fuchs (NOVA)		1-3-2008
E. Gaburov (NWO)	1-9-2008	
B. Groves (UL)		31-10-2008
B. Groves (NOVA)	1-11-2008	
C. Guendisch (UL)		1-10-2008
P. Hallibert (NOVA)		1-10-2008
T. Hill (NOVA)		1-2-2008
H. Hoekstra (UL)	15-8-2008	
J. Holt (NWO)	1-1-2008	
K.>m Isokoski (NOVA)	1-1-2008	
A. Johanssen (NWO)	1-1-2008	
T. van Kempen (NWO)		1-12-2008
A. Kospal (NWO)	1-5-2008	
L. Kristensen (UL)	1-10-2008	
S. Levin O'Donnell (UNAWWE)		1-11-2008
H.V.J. Linnartz (UL,NOVA)		31-8-2008
H.V.J. Linnartz (UL)	1-9-2008	
P. Marrese (NWO)		31-12-2008
P. Marrese (NOVA)	1-1-2009	
H. Masso Gonzalez (NWO)	1-5-2008	
R.J. Mathar (NWO)		1-9-2008
G.K. Miley (UL)		31-10-2008
M. Mosleh (EU)	1-1-2009	
A. Omar (NWO)		1-10-2008
P. Oosthoek (UL)	1-3-2008	
D. Riquez Oneca (EU)	1-5-2008	

L. van Starckenburg (NOVA)		1-9-2008
D.H.F.M. Schnitzeler (NWO)		1-9-2008
D. Serre (NOVA)	1-3-2008	
C. Tasse (UL)		1-2-2008
A.G.G.M. Tielens (UL)	1-1-2009	
H.E. Verbraak (FOM)		1-4-2008
F. van de Voort (NWO)	1-4-2008	
M. Weiss (Teijler's St.)	1-12-2008	
U. Yilmiz (UL)	1-11-2008	



Appendix **II**

**Committee
membership**

**Sterrewacht
Leiden**

Committee membership

Appendix II

II.1. Observatory Committees

(As on December 31, 2008)

Directorate

(Directie onderzoekinstituut)

K. Kuijken (director of research)

F.P. Israel (director of education)

J. Lub (institute manager)

Observatory management team

(Management Team Sterrewacht)

K.H. Kuijken (chair)

E.R. Deul

K. Groen (minutes)

F.P. Israel

J. Lub

Oversight council

(Raad van Toezicht)

J.A.M. Bleeker (chair)

B. Baud

J.F. van Duyne

W. van Saarloos

C. Waelkens

Research committee

(Onderzoek-commissie OZ)

M. Franx (chair)

H. Cuppen

A.G.A. Brown

W. Jaffe

Y. Levin

P.P. van der Werf

Research institute scientific council

(Wetenschappelijke raad onderzoekinstituut)

W. Boland	H.J. van Langevelde
B. Brandl	R.S. Le Poole
A.G.A. Brown	Y. Levin
D. van Delft	H.V.J. Linnartz
E.R. Deul	J. Lub
E.F. van Dishoeck	F. van Lunteren
M. Franx	G.K. Miley
M. Garrett	M. Perryman
T. de Graauw	A. Quirrenbach
H. Habing	H.J.A. Röttgering
M. Hogerheijde	J. Schaye
V. Icke	I. Snellen
F.P. Israel	R. Stuik
W.J. Jaffe (chair)	P.P. van der Werf
P. Katgert	P.T. de Zeeuw
K.H. Kuijken	

Institute council

(Instituutsraad)

E. Deul (chair)	W.J. Jaffe
J. Drost	M. Smit
F.P. Israel	

Astronomy education committee

(Opleidingscommissie OC)

P.P. van der Werf (chair)	P. Langelaan
M.C. Damen	H. Linnartz
C. de Valk	J.T. Pijloo
P. Oosthoek (minutes)	J. Schaye
M. Franx	H. Röttgering
V. Icke	S. van den Broek

Astronomy board of examiners

(Examencommissie)

J. Lub (chair)	I. Snellen
E. Groenen (Physics)	P.P. van der Werf
F.P. Israel	

Oort scholarship committee

F.P. Israel
H. Röttgering

J. Schaye

Mayo Greenberg prize committee

G. Miley (chair)
E.F. van Dishoeck
P. Katgert

H. Linnartz
J. Lub

MSc admission advisory committee

M. Franx (chair)
F.P. Israel

K. Kuijken
H.J. Röttgering

Graduate student review committee (2008 Cttee)

(Commissie studievoortgang promovendi)

M. Franx (chair)
W. Boland

H. Linnartz
J. Schaye

Colloquia committee

Y. Levin

J. Schaye

Computer committee

A.G.A. Brown (chair)
B. Brandl
C. Dalla Vecchia
K. Groen

C. Hopman
M. Smit
R. Williams

Library committee

W.J. Jaffe (chair)
F.P. Israel

J. Lub

Public outreach committee

F.P. Israel (chair)
V. Icke
M. Damen

T. van Kempen
N. de Vries

Social committee

M. Smit (chair)

J. Bast

D. Raban

E. Caris alias Reynders (left Nov 1)

C. Gündisch (left Oct 1)

C. Hopman

I.A.G. Snellen

II.2. Membership of University Committees

(As on december 31, 2008)

Deul

Member Begeleidings Commissie ICT projecten
Chair Institute Council
Chair Facultair Overleg ICT
Member Facultair Beleids Commissie ICT
Member Observatory Management Team

van Dishoeck

Chair, Faculty Research Committee (WECO)
Member, Raad van Toezicht, Leiden Institute of Physics (LION)

Franx

Member, Faculty Research Committee (WECO)
Director, Leids Kerkhoven-Bosscha Foundation
Director, Leids Sterrewacht Foundation
Director, Jan Hendrik Oort Foundation

Hoekstra

Member CFHT Science Advisory Committee until 12/2008

Hogerheijde

Member, Board of Directors, Leids Kerkhoven-Bosscha Fonds
Member, Board of Directors, Leids Sterrewacht Fonds
Member, Board of Directors, Jan Hendrik Oort Foundation
Member, Opleidngscommissie ex officio as study adviser First-year BSc students

Icke

Member, Advisory Council, Faculty of Creative and Performing Arts
Member, Belvédère Committee

Israel

Member, Committee of Education Directors, School of Sciences
Member, Board of Graduate School, School of Sciences

Jaffe

Member, Observatory Research Committee
Chairman, Observatory Scientific Council (Wetenschappelijk Raad)

Kuijken

Member, Faculty Science Committee (WECO) (-Jun)
Chair, Observatory Research Committee (-Jun)
Member, Chair, Observatory Management Team
Study Advisor BSc students (-Jul)
Chair, search Committee astronomy professor
Member, search Committee director Lorentz Centre
Member, search Committee Teylers professor of history of science
Member, search Committee Boerhave professor
Member, board of directors Leidsch Kerkhoven-Bosscha Fonds
Member, board International Center
Chairman, board of directors Leids Sterrewacht Fonds
Chairman, board of directors Oort Fonds

Linnartz

Study advisor bachelor students (2nd/3rd year) astronomy
Member astronomy education committee
Member, FMD/ELD user committee
Member, J. Mayo Greenberg Scholarship Prize Committee
Observatory representative national science day
Observatory representative press releases

Van Lunteren

Member, Board Stichting Historische Commissie voor de Leidse
Universiteit
Member, Scientific Board, Scaliger Instituut
Member, Committee 'Eerste-jaars-boek-project'

Miley

Chairman, Selection Committee, J. Mayo Greenberg Scholarship Prize
Chairman, PhD Guidance Committee ADD

Röttgering

Member, Science team MID-infrared Interferometric instrument for VLTI (MIDI)

Member, XMM Large Scale Structure Survey Consortium

Member, Science team Omegacam, a wide field imager for the VLT Survey Telescope PI, DCLA (Development and Commissioning of LOFAR for Astronomy) & project for the scientific preparation of science with & LOFAR at 4 partaking Netherlands universities

Member, ASTRON Science Advisory Committee

Member, Spitzer warm legacy survey project SERVS

Snellen

Member, Leiden International Student Fund (LISF) committee

Member, Facultair Wervingsoverleg

Member, PR committee Physics/Astronomy

Van der Werf

Chairman, Education Committee Astronomy

Member, Joint Education Committee Physics and Astronomy

Member, Research Committee

Member, Examination Committee

Organist of the Academy Auditorium



Appendix **III**

Science
policy

functions

Sterrewacht
Leiden

Science policy functions

Appendix III

Brandl

Deputy workpackage manager, ELT Design Study WP11000 (Instrumentation)

"Principal Investigator of the E-ELT METIS phase A study"

Deputy Co-PI, European JWST-MIRI consortium

Co-Investigator, Spitzer-IRS

Chair, Scientific Organizing Committee of the Conference on '400 Years of Astronomical Telescopes'

Member, NOVA Instrument Steering Committee (ISC)

Instrument scientist of JWST-MIRI Spectrometer

Member, Herschel 'KINGFISH' Key Program

Member, ELT Design Study WP 5000 (Science preparations)

Brown

Member, IAU Commissions 8, 37

Member, Gaia coordination unit 5 'Photometric processing' management team

Member, EU Marie-Curie RTN European Leadership in Space Astrometry (ELSA)

van Delft

Member commissie 'Duizend meesterwerken', Digitale Bibliotheek der Nederlandse Letteren

Member commissie wetenschapsgeschiedenis KNAW

Member jury Annual Prize Wetenschap en maatschappij

Member Interdisciplinary Program Board Lorentz Center / NIAS

Member organisatie KunstWetenschapSalon

Member adviesraad tijdschrift NWT (Natuur, Wetenschap en Techniek)

Member Raad van Advies Jaarboek KennisSamenleving

Member jury P.C. Hooftprijs 2008.

Ambassador Platform bètatechniek
Member begeleidingscommissie Digitaal Wetenschapshistorisch Centrum,
Huygens Instituut
Member comité van aanbeveling Science Café Leiden

van Dishoeck

Scientific Director, Netherlands Research School for Astronomy (NOVA)
Associate Editor, Annual Reviews of Astronomy & Astrophysics
Member, ALMA Board
Member, SRON Board
Member, MPIA-Heidelberg Fachbeirat
Member, SMA Advisory Committee
Member, Spitzer Time Allocation Committee GO4
Member, Herschel-HIFI Science team
Member, ASTRONET Science Vision Panel-C
Member, VICI committee EW
Co-PI, European JWST-MIRI consortium
Chair, IAU Working Group on Astrochemistry
Member, IAU Commission 14, working group on 'molecular data'
Coordinator, Herschel-HIFI WISH Key Program
Member, Search committee Wykeham Professor of Physics, Oxford University
Chair, SRON Science Advisory Committee
Member, National Committee on Astronomy (NCA)
Member, Scientific Organising Committee, New light on young stars: Spitzer's
view of circumstellar disks, Pasadena
Member, Scientific Organising Committee, Lorentz Center workshop on
Interstellar surfaces, Leiden
Member, Search committee SRON director
Member, Search committee chair in star- and planet formation, ETH Zurich

Franx

Chair, Nova network 1 science team
Member, MUSE science team
Member, JWST-NIRSPEC science team
Member, JWST Science Working Group
Member, ACS science team
Chair, ESO-ELT Science Working Group
Member, ESO-ELT Science and Engineering Core Working Group
Member, NL-PC Allocation Committee

Hogerheijde

Member, ALMA Science Advisory Committee
Member, ALMA European Science Advisory Committee
Member, ALMA Science Integrated Project Team
Member, ALMA Regional Center Coordinating Committee
Member, IRAM Programme Committee
Member, NWO VENI selection committee
Member, NWO/Vrije Competitie selection committee
Member, Review committee JCMT Science Archive ADP Requirements
Project scientist for CHAMP+/Netherlands
Co-Coordinator, JCMT Gould Belt Legacy Survey
Member, SOC/LOC workshop 'Scientific Exploitation of the Enhanced-SMA'
(Leiden, NL; Feb 1-2)
Member, SOC NAASC workshop 'Transformational Science with ALMA:
Through Disks to Stars and Planets' (Charlottesville, USA; Jun 22-24)

Icke

Member, National Committee on Astronomy Education
Member, Minnaert Committee (NOVA Outreach)
Member, Netherlands Astronomical Society Education Committee
Member, Editorial Council Natuur & Techniek
Member, Advisory Council, Technika 10
Member, Board of Directors, Nederlands Tijdschrift voor Natuurkunde
Member, Jury 'Rubicon' (NWO)
Member, Jury, Annual Prize 'Wetenschap en Maatschappij'

Israel

Member, NWO Selection Committee for VIDI Awards
Member, NWO Selection Committee for Free Competition Awards
Member, IAU Commissions 28, 40 and 51
Member, Science Team Herschel-HIFI
Member, Science Team JWST-MIRI
Member, Science Team APEX-Champ+
Member, Editorial Board Europhysics News
Coordinator-NL SCUBA2 Legacy Survey Nearby Galaxies

Jaffe

Director, NEVEC
Member, IAU Commission 40, 28
Chairman, ESO User's Committee
Member ESO Contact Committee

Member FITS Working Group

Katgert

Secretary/Treasurer, Leids Kerkhoven-Bosscha Fonds

Secretary/Treasurer, Leids Sterrewacht Fonds

Secretary/Treasurer, Jan Hendrik Oort Fonds

Kuijken

Advisor to National Delegate, ESO Council (Sep-)

Chair, ESO contact committee (Sep-)

Member, board of directors Kapteyn fonds

Member, board NOVA (Jul-)

Key researcher, NOVA Dieptestrategie

Member, ESO KMOS Instrument Science Team

Member, astronomy programme board Lorentz Centre

Principal Investigator, ESO KiDS Survey

Principal Investigator, OmegaCAM project

Co-investigator, ESO VIKING Public Survey

Co-investigator, Planetary Nebulae Spectrograph project

Deputy coordinator, DUEL EU-FP6 Network

Local coordinator, EVALSO EU-FP7 programme

Member, board EARA

Member, board MICADO E-ELT instrument design study

External member, FWO-Flanders astronomy & physics programme committee

External member, Rijksuniversiteit Groningen Faculty tenure committee

Member, National commission for astronomy (NCA)

Member, ESA Concept Advisory Team European Dark Matter Mission

Member, board Physics society 'Diligentia', The Hague (April-)

van Langevelde

Member board of directors Leids Kerkhoven Bosscha Fonds

Member board of directors Leids Sterrewacht Fonds

Member board of directors Jan haendrik Oort Fonds

NWO I-science program committee

SKA klankbordgroep NL

Allegro steering committee

IAU, division X, comission 40

NL-URSI committee

Member, ESO STC

Member, ESO VLTi overview committee

Member, ESO contactcommissie

Member, NOVA Instrumentation Steering Committee

Member EVN board
 Member, RadioNet Board and Executive Board
 PI, ALBUS project (RadioNet)
 Coordinator EXPreS, board member and member management team
 PI, FABRIC project (EXPreS)
 PI, SCARIE project (NWO STARE program)
 Member, ESTRELA board
 Member SKADS board
 Member PrepSKA board
 Member European SKA Consortium

Linnartz

Special chair for Molecular Laboratory Astrophysics, Laser Centre VU
 Workgroup leader FOM group FOM-L-027
 Workgroup leader FP6 RTN program 'The Molecular Universe'
 Member, FOM-NWO working group 'COMOP'
 Member, CW-NWO working group 'Spectroscopy and Theory'
 Member, HRSMC research school
 Member international scientific committee for ?Workshop on infrared plasma spectroscopy?
 Editor, CAMOP / Phys. Scripta

Lub

Secretary, Netherlands Committee for Astronomy
 Member, Board Astronomy & Astrophysics

van Lunteren

Member, Huizinga Instituut, The Netherlands Research School for Cultural History
 Member, Scientific Organizing Committee, Lorentz Centre Workshop 'Artificial Cold'
 Member, Selection Committee Program 'Philosophical Foundations of the Historiography of Science', Department of Philosophy, Leiden University
 Member, Commissie Dijkgraaf voor de Bètacanon

Miley

Vice President, International Astronomical Union responsible for Education and Development
 Chair, International Universe Awareness Steering Committee
 Chair, LOFAR Research Management Committee
 Chair, Selection Committee, Christiaan Huygens Wetenschapsprijs 2008 ADD
 Chairman, LOFAR Survey Science Group, Highest Redshift Objects

Member Executive Committee International Astronomical Union
 Member, LOFAR Astronomy Research Committee
 Member, Board of Governors of the LOFAR Foundation
 Member, Max Planck Institut fur Radioastronomie Fachbeirat
 Member, Board EU SKADS Project
 Member, Core Team, LOFAR Surveys Key Project
 In his capacity as Vice President of the IAU with the portfolio of development and Education, Miley was charged with producing a decadal plan for global astronomy development for discussion by the IAU General Assembly in Rio de Janeiro in 2009. He organized a brainstorm of stakeholders and a first draft of an ambitious decadal strategic plan was completed.

Röttgering

Member, LOFAR Astronomy Research Committee (ARC)
 Member, Curatorium of the professorship at Leiden University "Experimental Astroparticle physics"
 Key researcher NOVA research school
 Member, ESO OPC
 Member, Spitzer TAC
 Member, ASTRON Science Advisory Committee
 Initiator NL contribution to Euclid spectrographic instrument.
 Co-Organiser conference: Astrophysics with E-LOFAR (Hamburg, Germany, Sept 16-19)

Schaye

Member of the steering committee, Virgo Consortium for Cosmological Supercomputer Simulations
 Co-Investigator, MUSE (Multi Unit Spectroscopic Explorer)
 Member, ISTOS (Imaging Spectroscopic Telescope for Origins Surveys)
 Key researcher, NOVA (the Dutch research school for astronomy)
 Member, LOFAR epoch of reionization science team
 Member, MUSE science team
 Member, ISSI team on Non-virialized X-ray components in clusters of galaxies
 NL-representative, Euro-VO Data Center Alliance, Theoretical astrophysics expert group
 PI, Marie Curie Excellence Team
 PI, OWLS collaboration
 Co-Investigator, ERASMUS (Elt Ready Available Super MUSE)
 Member, Xenia science team (A probe of cosmic chemical evolution)
 Chair, Organizing Committee, LC workshop "The chemical enrichment of the intergalactic medium"

Member, Scientific Organizing Committee, "Galaxies in real life and simulations"

Member, Scientific Organizing Committee, "Theory in the Virtual Observatory"

Member, PhD committee G. Worseck, Potsdam

Member, NWO Rubicon grant allocation committee

Snellen

Member Astron (WSRT/LOFAR) Programme Committee

Member NWO Vrije Competitie, subcommissie astronomie

Stuik

Chair LOC 400 years of Astronomical Telescopes

Associate member of the OPTICON Key Technologies Network

Member of the FP7 Network "Wide field imaging at the E-ELT: from GLAO to diffraction limit"

van der Werf

Member, JCMT Board

Chairman, JCMT Survey Oversight Committee (JSOC)

Principal Investigator, SCUBA-2 Cosmology Legacy Survey

Co-investigator, HIFI

Co-investigator, MIRI

Member, SAFARI Science team

Member, Far-InfraRed Interferometer (FIRI) study team

Member, METIS Science Team

Member, ING/JCMT Time Allocation Committee

Member, STFC Herschel Oversight Committee



Appendix **IV**

Visiting
scientists

Sterrewacht
Leiden

Visiting scientists

Appendix IV

Name	Dates	Institute
P. Woitke	Jan 8-12	University St. Andrews, Scotland
D. Serre	Jan 21	Observatoire Midi-Pyrenees, France
L. Sales	Jan 31-Feb 1	Kapteyn Institute, Netherlands
A. Duffy	Feb 4-Feb 8	Manchester University, UK Astrophysical Institute Potsdam, Germany
J.Gerssen	Feb 4	UCLA, USA
A. Stolte	Feb 5	University of Nottingham, UK
M.R. Merrifield	Feb 7-8	MPE
O. Gerhardt	Feb 7-8	ESO
M. Arnaboldi	Feb 7-8	Groningen, Netherlands
N. Douglas	Feb 7-8	Naples, Italy
N. Capaccioli	Feb 7-8	Naples, Italy
N. Napolitano	Feb 7-8	MPE
L. Coccato	Feb 7-8	Nottingham, UK
A. Cortesi	Feb 7-8	Basel, Switzerland
F. di Lorenzi	Feb 7-8	NASA Goddard, USA
T.R. Gull	Feb 17-Feb 23	
A. Youdin	March 3-7	
J. Allamandola	March 15- May 15	NASA-AMES, USA
G. Ogrean	April 7-11	Jacobs University, Germany
M. Realdi	June 7-30	University of Padova, Italy
A. Duffy	June 13	Manchester University, UK
J. Cuadra	June 23-26	JILA, University of Colorado, USA
D. Whelan	June 25- July 8	University of Virginia, USA
S. Bertone	August 1-15	UCSC, USA

K. Holhjem	August 21-29	Bonn University, Germany
H.S. Zhao	Sep-Dec	St. Andrews, UK
C. Bildfell	Sep 8-16	University of Victoria, USA
L.J. Allamandola	Sep 15-Nov 15	NASA-AMES, USA
K. Finlator	Sep 22	University of Arizona, USA
P. Abraham	Sep 24-29	Konkoly Observatory, Hungary
G. v.d. Ven	Oct 1-3	IAS Princeton, USA
T.R. Gull	Oct 1-6	NASA Goddard, USA
L. Burscher	Oct 6-Nov 7	MPIA Heidelberg, Germany
A. Duffy	Oct 13-17	Manchester University, UK
L. Pulone	Oct 27-31	INAF-Rome, Italy
M.Castellani	Oct 27-31	INAF-Rome, Italy
A. Youdin	Nov 10-14	CITA, U of Toronto, Canada
M. Schirmer	Nov 18-22	Bonn University, Germany
C. Heymans	Nov 20-22	Edinburgh, UK
M. Lerchster	Nov 20-22	Munich, Germany
L.V. Waerbeke	Nov 20-22	British Columbia
K. Holhjem	Nov 20-22	Bonn
Y. Mellier	Nov 20-22	Paris, France
L. Miller	Nov 20-22	Oxford
T. Kitching	Nov 20-22	Oxford
E. Sembolini	Nov 20-22	Bonn
T. Erben	Nov 20-22	Bonn
L. Fu	Nov 20-22	Naples
M. Hudson	Nov 20-22	Waterloo
A. S. Cohen	Dec 8-12	Naval Research Lab, Washington, USA
S. Brown	Dec 8-19	Institute of Astronomy, Cambridge, UK
R.C.E. v.d. Bosch	Dec 15-31	University of Texas at Austin, USA
A. Gurkan	many visits throughout the year	UvA, Amsterdam, Netherlands

Appendix **V**

Workshops,
lectures,
and colloquia
in Leiden

Sterrewacht
Leiden

Workshops, lectures and colloquia in Leiden

Appendix V

V.1. Workshops

Most of the workshops were held in the Lorentz Center, an international center which coordinates and hosts workshops in the sciences. In 2007 the Leiden astronomers contributed to the following workshops there:

January 28 - February 1

Galaxy evolution from mass-selected samples

M. Franx

February 4-6

Meeting of the DUEL Network, Lorentz Center, 2008 DUEL meeting

K.H. Kuijken, H.J. Hildebrandt, M.B.M. Velander, T. Schrabback, E. van Uitert, D.M. Smit

February 7-8

Planetary Nebulae Spectrograph team meeting

K.H. Kuijken

March 18 - 20

Ultravista Science team meeting

M. Franx

March 31- April 3

Astro-WISE workshop

K.H. Kuijken, E.R. Deul

June 27–July 2

SPIE - astronomical telescope and instrumentation

L. Jolissaint

August 4–8

Artificial Cold and International Cooperation in Science, Lorentz Centre 'The Metric Convention and its aftermath: rivalries, loyalties and controversies'

F.H. van Lunteren

August 19–22

Pencil Code Meeting 2008

A. Johansen

September 8–12

Member SOC and chairman LOC of Lorentz Workshop: Cool, Cooler, Cold--Cluster Cooling Flows in a new Light

W.J. Jaffe

September 15–19

Galaxies in real life and simulations

A. Cimatti, P. van Dokkum, M. Kriek, N.M. Forster Schreiber, J. Schaye, R. Somerville

October 6–10

Interstellar surfaces, from laboratory to models

H.M.Cuppen, H. Linnartz, E.F. van Dishoeck, E. Herbst, S. Viti

September 29 - October 2

400 years of Astronomical Telescopes - A review of History, Science and Technology

B. Brandl, R. Stuik

November 20–22

Canada-France-Hawaii Legacy Survey weak lensing working group meeting

K.H. Kuijken, H. Hoekstra, H.J. Hildebrandt, M.B.M. Velander, T. Schrabback, E. van Uitert, D.M. Smit

November 21–27

Fitting the Spectral Energy Distributions of Galaxies

B. Groves, J. Walcher, 48 Attendees

Website (Including talks):

<http://www.lc.leidenuniv.nl/lc/web/2008/314/info.php3?wsid=314>

December 10-12

The first Science with LOFAR surveys

H.J.A. Röttgering

December 11

The national JWST-MIRI discussion day took place in Leiden, attended by about 20 scientists. The main topics of the meeting were an overview and status of JWST and its instruments, the status of MIRI hardware, testing, calibration, operations and plans for data reduction, and the possibilities for Dutch scientists to get involved in the MIRI guaranteed time observing program.

E.F. v. Dishoeck.

V.2. Endowed Lectures

Date	Speaker (affiliation)	Title
Apr 23	Simon White	<i>All from Nothing; the structuring of our Universe</i> (Oort lecture)
Dec 8	Didier Queloz	<i>The amazing zoo of extrasolar planets</i> (Sackler lecture)

V.3. Scientific Colloquia

Date	Speaker (affiliation)	Title
Jan 24	Peter Jonker (SRON)	<i>Neutron Stars in X-ray binaries: what can we learn from them?</i>
Jan 31	David Spergel (Princeton)	<i>The microwave background as a backlight for astronomy</i>
Feb 2	Ralf Bender (MPE/LMU)	<i>The supermassive black hole and circumnuclear disk in the center of M31</i>
Feb 2	Eli Waxman (Weizmann Institute)	<i>High Energy neutrino & cosmic-ray astronomy (NOVA colloquium)</i>
Feb 21	Ted Gull (NASA GSFC)	<i>Eta Carinae: an astrophysical laboratory (NOVA colloquium)</i>
Feb 28	Milos Milosavljevic (University Texas)	<i>Aspects of the co-evolution of massive black holes and galaxies</i>

Mar 3	Martin Asplund (MPA)	<i>Lithium in the early Universe: signatures of physics beyond the standard model?</i>
Mar 13	Justin Kasper (MIT)	<i>Low frequency radio exploration of the heliosphere (NOVA colloquium)</i>
Mar 20	Frits Paerels (Colombia)	<i>The high ionization intergalactic medium</i>
Mar 27	Håkan Svedhem (ESA)	<i>Venus and Venus express</i>
Apr 3	Andrew Blain (Caltech)	<i>The astrophysics and evolution of dust-enshrouded galaxies (NOVA colloquium)</i>
Apr 10	Malcolm Fridlund (ESA)	<i>Recent exo-planetary results from the CoRoT space mission</i>
Apr 17	Simon White (MPA)	<i>Galaxy halos at (very) high resolution</i>
Apr 18	Richard Schillizi (SKA)	<i>The square kilometer array</i>
Apr 24	Nahum Arav (University of Colorado)	<i>Measuring kinetic luminosity of quasar outflows: results from VLT observations and implications for AGN feedback</i>
May 5	Pavel Kroupa (University of Bonn)	<i>Dense stellar systems: The fundamental building blocks of galaxies</i>
May 13	Dominic Schnitzeler (Leiden)	<i>Faraday tomography of the Galactic ISM with the WSRT (PhD thesis colloquium)</i>
May 15	Julian Krolik (Johns Hopkins)	<i>Dynamics of accretion discs around black holes (NOVA colloquium)</i>
May 29	Martin McCoustra (Edinburgh)	<i>Shining a little light on astronomical surfaces</i>
June 9	Xander Tielens (NASA Ames)	<i>PAHs and star formation</i>
Sep 5	Remco v.d. Bosch (Leiden)	<i>Giant Elliptical Galaxies (PhD student colloquium)</i>
Sep 9	Lottie van Starckenburg (Leiden)	<i>Dynamics of high redshift disk galaxies (PhD student colloquium)</i>
Sep 11	Gary Ferland (University of Kentucky)	<i>The Orion environment and its magnetic field</i>
Sep 18	Alice Shapley (UCLA)	<i>The Metallicities and Physical Conditions in Star-forming Galaxies at High-Redshift</i>
Sep 23	Tim van Kempen (Leiden)	<i>Probing Protostars: The physical structure of gas and dust during low-mass star formation (PhD student colloquium)</i>

Sep 25	Joshua Bloom (University of California, Berkeley)	<i>GRBs in a Cosmology Context</i>
Okt 2	Guy Worthey (Washington State)	<i>Element by Element Abundances from Integrated Light (NOVA colloquium)</i>
Okt 10	Eric Herbst (Ohio State University)	<i>Complex Interstellar Molecules</i>
Okt 16	Louis J. Allamandola (NASA Ames)	<i>Astronomical Polycyclic Aromatic Hydrocarbons: Yesterday, Today, and Tomorrow</i>
Okt 17	Christian Brinch (Leiden)	<i>The evolving velocity field around protostars (PhD student colloquium)</i>
Okt 30	Andrew Collier Cameron (University of St. Andrews)	<i>Sizing-up extrasolar planets</i>
Nov 6	Henk Hoekstra (Leiden Observatory)	<i>Weak Lensing by Large Scale Structure</i>
Nov 13	Frank v.d. Bosch (MPIA Heidelberg)	<i>The Galaxy-Dark Matter Connection</i>
Nov 20	Marcus Bruggen (Jacobs University Bremen)	<i>Simulations of feedback by active galactic nuclei</i>
Nov 26	Simon Albrecht (Leiden Observatory)	<i>Spectro-photometric observations of eclipsing binaries and transiting planets (PhD Colloquium)</i>
Nov 27	Michael Kramer (The University of Manchester)	<i>Pulsars as a tool to probe fundamental physics</i>
Dec 8	Didier Queloz (Geneva Observatory)	<i>The Amazing Zoo of Extrasolar Planets (Sackler lecture)</i>
Dec 12	Andrey Kravtsov (University of Chicago)	<i>Modeling molecular gas and star formation in cosmological simulations</i>

V.4. Student Colloquia

Date	Speaker	Title
Feb 16	Maurice Westmaas	<i>The Characterization of Phaseplates for an Astronomical Adaptive Optics Test Bed</i>
Feb 21	Maarten van Hoven	<i>Tidal Excitation of Stellar Modes During Close Gravitational Encounters with an Intermediate Mass Black Hole</i>
Feb 23	Isa Oliveira	<i>Multiwavelength Study of a New Young Stellar Population in the Serpens Molecular Cloud</i>
Mar 19	Olivera Rakic	<i>Observations of the Intergalactic Medium near Lyman Break Galaxies</i>
Apr 24	Bart Clauwens	<i>Full 1-loop corrections to D-term Inflation Potential</i>
June 12	Floor Roduner	<i>Grids in the Walraven photometric system and their application to S Norma and I Carinae</i>
June 14	Robert Berkhout	<i>Evolution of the bursting-layer wave during a Type-1 X-ray burst</i>
July 05	Berry Holl	<i>Ionospheric calibration study for LOFAR</i>
July 10	Art Bos	<i>IRS spectroscopy of Massive YSOs in W49A</i>
Aug 16	Reinier Tan	<i>Implementation of two control algorithms on HORATIO</i>
Aug 23	Christopher Bonnett	<i>Constraining Cosmology Using the Full Lensing Surface Density Obtained by Weak Lensing</i>
Sep 21	Adriaan Kroonenberg	<i>Ionised gas in early-type galaxies</i>
Oct 02	Eveline van Scherpenzeel	<i>How many photons are needed to ionize the Universe?</i>
Oct 16	Edo van Uitert	<i>The measurement of weak gravitational lensing: STEP4 & KISS</i>
Nov 13	Silvia Toonen	<i>The kinematics of the ionized gas in NGC 6946: Large and small scales</i>
Nov 20	Susanne Brown	<i>PAH emission, dust emission and extinction in NGC253</i>

Nov22	Ernst de Mooij	<i>The colour-radius relation for low-redshift galaxies from the SDSS</i>
Nov 23	Ann Marie Madigan	<i>Resonant Relaxation near Massive Black-Holes</i>
Dec 07	Mark den Brok	<i>Atomic and molecular gas around three galactic H II regions</i>



Appendix **VI**

Participation
in scientific
meetings

Sterrewacht
Leiden

Participation in scientific meetings

Appendix VI

Alexander

Planet formation processes and the development of prebiotic conditions
(Pasadena, CA, USA; March 18-21)

Cool Stars 15 (St Andrews, UK; July 21-25)

New light on young stars: Spitzer's view of circumstellar disks (Pasadena, CA, USA; Oct 26-30)

Amiri

ESTRELA Workshop (Bonn; April)

Radio Astronomy School (Siguenza, Spain; Aug 26- Sep 4)

EVN Symposium (Bologna; Sep23-26)

IRAM Interferometry School (Grenoble; Oct 6-10)

IAU Symposium, Cosmic Magnetic Field Conference (Tenerife; Nov 2-7)

Andersson

The Molecular Universe (Arcachon, France; May 5-8)

Correspondence between Concepts in Chemistry and Quantum Chemistry
(Valadalen, Sweden; Aug 25-28)

Interstellar Surfaces: From Laboratory to Models, Lorentz Center Workshop
(Leiden, Netherlands; Oct 6-10)

Baneke

3rd International Conference of the European Society for the History of Science (Vienna, Austria; Sep 10-12)

KNAW / Huygens Instituut Symposium (Amsterdam; Nov 27-28)

'Nut en nog eens nut'

Symposium (Utrecht; Dec 12)

'Over de grens. Internationale contacten aan Nederlandse universiteiten sedert 1876'

Bast

ISM/CSM meeting (Amsterdam, Netherlands; Apr 21)

IRS/CRIRES team meeting (Garching, Germany; May 12-14)

JENAM 2008 (Vienna, Austria; Sep 8-1)

'New challenges to European astronomy'

IRS/CRIRES team meeting (Pasadena, USA; Oct 24-26)

5th Spitzer Conference (Pasadena USA; Oct 26-30)

'New light on young stars: Spitzer's view of circumstellar disks'

ISM/CSM meeting (Leiden, Netherlands; Nov 7)

Bouwman

CW meeting (Lunteren, Netherlands; Jan 28-29)

'Theory and spectroscopy'

ISM/CSM Meeting (Amsterdam, Netherlands; Apr 21)

Molecular Universe (Arcachon, France; May 5-8)

Lorentz Center Meeting (Leiden, Netherlands; Oct 06-10)

NNV-AMO meeting (Lunteren, Netherlands; Oct 28-29)

ISM/CSM Meeting (Leiden, Netherlands; Nov 7)

Brandl

SPIE meeting on Astronomical Telescopes and Instrumentation (Marseille, France; June 20-29)

400 Years of Astronomical Telescopes (Noordwijk, Netherlands; Sep 29 - Oct 2)

Fitting the spectral energy distribution of galaxies (Leiden, Netherlands; Nov 17-20)

Brinch

Dutch ISM/ICM meeting (Amsterdam, Netherlands; Apr 21)

NAC (Dalfsen, Netherlands; May 7-9)

Brinchmann

Wide-field imaging from Dome C (Exeter, UK; Mar 26-27)

Lorentz workshop (Leiden, Netherlands; Sep 15-19)

'Galaxies in Real Life and Simulation'

Lorentz Workshop (Leiden, Netherlands; Nov 17-21)

'Fitting the spectral energy distribution of galaxies'

Brown

CU5 Pipeline Framework Workshop (Cambridge, UK; Jan 29-30)

Gaia calibration working group meeting (Villafranca del Castillo, Spain; Feb 22)

Talk: 'Photometry calibration requests'

Gaia joint CU5/CU3 meeting (Barcelona, Spain; Apr 7-11)

Gaia DPAC radiation task force meeting (Cambridge, UK; Apr 14-15)

Gaia radiation calibration working group meeting (Noordwijk, Netherlands; Apr 23)

Talk: 'Report on DPAC Radiation Task Force activities'

Nederlandse Astronomen Conferentie (Dalfsen, The Netherlands; May 7-9)

Poster: 'Gaia mission preparations in the Netherlands'

Gaia calibration working group meeting (Noordwijk, Netherlands; Jun 12)

Gaia main data base meeting (Villafranca del Castillo, Spain; Jun 20)

ELSA Workshop on Software Engineering and Numerics (Barcelona, Spain; Sep 1-5)

Gaia Radiation Calibration Working Group meeting (Toulouse, France; Sep 16)

Gaia CU5 meeting (Edinburgh, UK; Sep 17-19)

Gaia IDT/FL coordination meeting (Heidelberg, Germany; Oct 1-2)

Talk: 'Shape parameters for BP/RP spectra'

Gaia DPAC Radiation Task Force meeting (Cambridge, UK; Oct 6-7)

Classification and Discovery in Large Astronomical Surveys (Tegernsee, Germany; Oct 14-17)

Invited talk: 'Learning about Galactic structure with Gaia astrometry'

Gaia Calibration Working Group meeting (Toulouse, France; Dec 2)

Talk: 'First DPAC inputs for Gaia Calibration Plan'

Busso

NAC (Dalfsen, The Netherlands; May 7-9)

Gaia Coordination Unit 5 (Edinburgh, UK; Sep 18-19)

'Photometric Processing'

Cuppen

ISSI team meeting (Bern, Switzerland; Jan 7-10)

IAU symposium 251 (Hong Kong, China; Feb 18-22)

Molecular Universe meeting (Arcachon, France; May 3-9)

Workshop Interstellar Surfaces (Leiden, The Netherlands; Oct 6-10)

AMO meeting (Lunteren, The Netherlands; Oct 28-29)

ISSI team meeting (Bern, Switzerland; Dec 2-4)

Graduate Course on Theoretical Chemistry and Spectroscopy (Han-sur-Lesse, Belgium, Dec 15-19)

van Delft

Communicating Medicine: Objects and Objectives (Manchester, UK; Mar 6-7)

'Museum Boerhaave and the History of Science'

NNV en de Industrie (Utrecht, Netherlands; Apr 11)

'Museum Boerhaave en de industrie'

This week's discoveries (Leiden, Netherlands; June 3)

'The invention of the telescope'

Frederik Kaiser Symposium (Leiden, Netherlands; June 10)

ICEC22-ICNM2008 (Seoul, Korea; July 21-25)

'Heike Kamerlingh Onnes and the road to liquid helium'

Artificial Cold and International Cooperation in Science (Leiden, Netherlands; Aug 4-8)

'Heike Kamerlingh Onnes and the road to liquid helium'

'The Family Kamerlingh Onnes: Cold & Art'

400 Years of Astronomical Telescopes (Noordwijk, Netherlands; Sep 29-Oct 2)

Artefacts (Washington, US; Oct 5-7)

Over de grens. Internationale contacten aan Nederlandse universiteiten sedert 1876 (Utrecht, Netherlands; Dec 12)

'Koude drukte. Het laboratorium van Heike Kamerlingh Onnes als internationaal centrum voor lage-temperaturenonderzoek'

Deul

Astronomical Data Analysis Software and Systems XVIII (Quebec, Canada; 2-5 Nov)

van Dishoeck

ISSI workshop: a new generation of databases for interstellar chemical modeling (Bern, Switzerland; Jan 7-8)

'Introduction to astrochemistry and its uses in astronomy' (invited lecture)

'Photoprocesses: rates and uncertainties' (Invited lecture)

IAU Symposium 251: Organic matter in space (Hongkong, China; Feb 16-21)

'Organic matter in space: an overview' (invited review)

Molecular universe: physics and chemistry of the ISM (Paris, France; May 6-9)

'Water in the universe' (invited review)

- From cores to disks: Spitzer-IRS + VLT-CRIRES meeting** (Garching, Germany; May 12-14)
- JWST-MIRI science team meeting** (Onsala, Sweden; May 28)
'Gas in protoplanetary disks: where and when?'
- KNAW symposium Telescopisch perspectie** (Amsterdam, Netherlands; June 23)
'ALMA: zooming in on the birthplaces of galaxies, stars and planets' (invited lecture)
- Herschel key program coordination and science exploitation workshop** (ESTEC, Netherlands; July 1-2)
'Water in star-forming regions with Herschel'
- Dalgarno celebratory symposium** (Boston, USA; September 9-12)
'Astrochemistry: building on Dalgarno's legacy' (invited review)
- Lorentz Center workshop Interstellar surfaces** (Leiden, Netherlands; Oct 6-10)
- From cores to disks: Spitzer-IRS + VLT-CRIRES meeting** (Pasadena, USA; Oct 24-26)
'Inner disk chemistry models'
- New light on young stars: Spitzer's view of circumstellar disks**(Pasadena, USA; Oct 26-30)
'Disks and their evolution: future prospects' (summary review)

Franx

- ELT-Science Working Group** (Garching, Germany; Apr 2)
- ELT-ESE** (Garching, Germany; Apr 3)
- Ultra-Vista planning meeting** (Paris, France; Apr 21-22)
- Nirspec Science Team meeting** (Estec; May 7-8)
- JWST Science Working Group meeting** (Estec; July 9-10)
- ESO Survey meeting** (Garching, Germany; Sept 16)
- ELT-Science Working Group** (Garching, Germany; Oct 7)
- ELT-ESE** (Garching, Germany; Oct 8)
- JWST Science Working Group meeting** (Palo Alto; Oct 21-23)
- Newfirm survey meeting** (New Haven, USA; Nov 18-21)
- Nirspec Science Team meeting** (Heidelberg; Dec 8-10)
- Cosmos science meeting** (Paris; June 6)

Groves

- EARA Herschel Meeting** (IAP, Paris, France; Feb 18-19)
- Probing Stellar populations out to the distant Universe** (Cefalú, Sicily, Italy; Sep 7-12)

Haas

Galaxy evolution from mass selected samples (Leiden, The Netherlands; Jan 28 - Feb 1)

Galaxies in Real Life and Simulations (Leiden, The Netherlands; Sep 15-19)

Hatch

Putting Gravity to work (Cambridge, UK; July 21-25)

The Cool, Cooler and Cold - Cluster Cooling Flows in a New Light (Leiden, Netherlands; Sept 8-12)

Understanding Lyman alpha Emitters (Heidelberg, Germany; Oct 6-10)

Hildebrandt

ESO UC Meeting (Garching, Germany; Apr 14-15)

CHFTLS-CARS shape measurements (Paris, France; May 28-30)

DUEL Workshop (Victoria, Canada; June 25-27)

Photometric Redshifts (London, UK; Sep 15)

PHAT - PHoto-z Accuracy Testing (Pasadena, USA; Dec 3-5)

Hoekstra

The Cool, Cooler and Cold - Cluster Cooling Flows in a New Light (Leiden; Sep 8-12)

SKA meeting (Dwingeloo; Nov 26-27)

CFHTLS Systematics Collaboration Meeting (Leiden, The Netherlands; Nov 20-22)

Texas Symposium (Vancouver; Dec 8-12)

Hogerheijde

Les Houches Ecole de Physique (Les Houches, France; Feb 18-29)

'Physics and Astrophysics of Planetary Systems'

Holt

Galaxy evolution from mass-selected samples (Leiden, The Netherlands; Jan 28 - Feb 1)

'Emission line outflows - the evidence for AGN-induced feedback'

UltraVISTA science team meeting (Leiden, The Netherlands; Mar 18-20)

From exoplanets to galaxy clusters: science with Astro-WISE (Leiden, The Netherlands; Mar 31 - Apr 3)

The fourth workshop on Compact Steep Spectrum and Gigahertz-Peaked Spectrum Radio Sources (Riccione, Italy; May 26-29)

Invited review: 'The host galaxy properties of Compact Steep Spectrum and Gigahertz-Peaked Spectrum radio sources'

Astro-WISE tutorial (Leiden, The Netherlands; Aug 18-20)

ESO public surveys phase 2 workshop (Garching, Germany; Sep 15-17)

Hopman

7th international LISA workshop (Barcelona; June 16-20)

'Extreme-Mass-Ratio Inspirals and Bursts'

2W@AEI meeting (on LISA, Postdam; Sep 1-12)

'The stochastic gravitational wave background from star-MBH fly-bys'

Icke

Lorentz Workshop "Symmetry" (Leiden, Netherlands; Mar 11-14)

Dutch Astrophysics Days(Leuven, Belgium; Mar 25-26)

Astronomenconferentie (Dalfsen, Netherlands; May 7-9)

Ioppolo

ISM/CSM Meeting (Amsterdam, Netherlands; Apr 21)

Molecular Universe (Arcachon, France; May 05-08)

Marie Curie Summer School on Laboratory Astrophysics (Boppard, Germany; Aug 27-Sep 01)

Interstellar Surfaces, From Laboratory to Models (Leiden, Netherlands; Oct 06 - 10)

ISM/CSM Meeting (Leiden, Nov 07)

Israel

Herschel Workshop (Paris, France; Feb 17-20)

Herschel Open Time Key Program Workshop (Noordwijk, Netherlands; Feb 20-21)

The Central Kiloparsec. Active Galactic Nuclei and their Hosts (Heraklion, Greece; June 4-6)

'Physical Conditions of Central Molecular Gas Concentrations'

400 Years of Astronomical Telescopes (Noordwijk, Netherlands; Sep 29 - Oct 2)

ARENA Workshop: Astronomy in Antarctica (Paris, France; Oct 8)

'The caase for the Magellanic Clouds'

The First Science with LOFAR Surveys (Leiden, Netherlands; Dec 10-12)

Jaffe

The Universe Under a Microscope(Bad Honnef, Germany; Apr 20-25)

Johansen

Supercomputing and Numerical Techniques in Astrophysics Fluid Flow Modelling (Evora, Portugal; Feb 12-15)

Planet Formation Processes and the Development of Prebiotic**Environments** (Pasadena, USA; Mar 17-21)**Dutch ISM/CSM meetings** (Amsterdam, Netherlands; Apr 21)**Mini-Workshop on (M)HD** (Amsterdam, Netherlands; June 4)**Origin and Evolution of Planets 2008** (Ascona, Switzerland; June 29-July 4)**Habitability in Our Galaxy** (Edinburgh, Scotland; Oct 8-10)**Cosmic Magnetic Fields: from Planets, to Stars and Galaxies** (Puerto Santiago, Spain; Nov 3-7)**Kendrew****Meeting of the MIRI European Consortium** (Villigen, Switzerland; Feb 26-29)**Discussion meeting on ELTs** (London, UK; May 8)**Workshop of the E-ELT Design Reference Mission** (Garching, Germany; May 20-21)**Meeting of the MIRI European Consortium** (Onsala, Sweden; May 28-30)**Progress meeting of METIS** (Heidelberg, Germany, Sep 8)**Dot Astronomy Conference** (Cardiff, UK; Sep 22-24)**Meeting of the METIS science team** (Garching, Germany; Oct 15)**MIRI Technical Interchange Meeting** (Didcot, UK; Dec 2-3)**Kospal****Sixth IRAM Millimeter Interferometry School** (Grenoble, France; Oct 6-10)**New Light on Young Stars: Spitzer's View of Circumstellar Disks** (Pasadena, CA, USA; Oct 26-30)*Title of poster presented: 'Quiescent phase mid-infrared variability of EX Lupi-type stars: clues to disk structure and accretion'***Kristensen****International Meeting on the Physics and Chemistry of the ISM** (Arcachon, France; May 6-9)**SLS Consortium Summer Meeting** (Groningen, the Netherland; Sept 9-10)**Herschel Pre-Launch Data Processing Workshop** (Madrid, Spain; Dec 4-5)**HIFI spectral survey data reduction workshop** (Bonn, Germany; Dec 8-10)**Kruip****Dutch Astrophysics Days** (Leuven, Belgium; March 25-26)*'Mathematical Properties of the SimpleX Algorithm'***Cosmic Dust & Radiative Transfer** (Heidelberg, Germany; Sep 15-17)*'SimpleX Radiative Transfer on Unstructured Grids'***ISM/CSM meeting** (Leiden, the Netherlands; Nov 7)*'Mass and Composition of the Dust in the Homunculus Nebula of Eta Carinae'*

Kuijken

Team meeting MICADO ELT design study (ESO Garching, Germany; Jan 8)

Kick-off meeting EVALSO project (ESO Garching, Germany; Jan 9)

ESA Dark Energy Mission Concept Advisory Team (Estec; Noordwijk, Netherlands, Jan 14-15)

ESA Dark Energy Mission Concept Advisory Team (Estec; Noordwijk, Netherlands; Feb 20-21)

ESO Committee of Council (Stockholm, Sweden; Mar 3-4)

ESA Dark Energy Mission Concept Advisory Team (Estec, Noordwijk, Netherlands; Mar 17)

ESO Council (Prague, Czech Republic; Jun 3-4)

MICADO team meeting (Venice, Italy; Jun 6)

EARA Board meeting (Cambridge, UK; Jun 20)

DUEL network meeting (Victoria, Canada; Jun 25-28)

ESO Survey Definition Meeting (ESO Garching, Germany; Sep 15-17)

Symposium 400 Years of astronomical telescopes (Estec Noordwijk; Sep 29-Oct 2)

ESO Committee of Council (Kopenhagen, Denmark; Oct 6-7)

i-Science workshop (Lorentz Center, Leiden; Oct 13-17)

Workshop 'Galaxy Surveys' (IAAP, Granada, Spain; Oct 22-24)

ESO Council (ESO Garching, Germany; Dec 2-3)

DUNE weak lensing working group (ETH Zürich, Switzerland; Dec 4)

Kuiper

Nederlandse Astronomen Conferentie (Dalfsen, Netherlands; May 7-9)

Galaxies in Real Life and Simulations (Leiden, Netherlands; Sep 15-19)

Understanding Lyman alpha emitters (Heidelberg, Germany; Oct 6-10)

van Langevelde

eMERLIN evolved stars key project workshop (Manchester, UK; Apr 8-9)

'eMERLIN, e-VLBI and the distances to evolved stars'

NAC 2008 (Dalfsen, Netherlands; May 7-9)

'e-VLBI: a real-time telescope larger than Europe'

VSOP2 meeting (Bonn, Germany; May 14-15)

TERENA 2008 (Brugge, Belgium; May 19 - 22)

'e-VLBI a telescope larger than Europe'

ASTRONET roadmap exercise (Liverpool, United Kingdom; June 16-19)

URSI General Assembly (Chicago, USA; Aug 10-15)

'e-VLBI: a real-time telescope of international dimensions'

EVN symposium (Bologna, Italy; Sep 22-26)

"The future of the European VLBI Network"

Symposium 400yr telescope (Noordwijk, Netherlands; Sep 29 - Oct 2)

I-Science workshop (Leiden, Netherlands; Oct 14-15)

'e_VLBI; a real-time telescope larger than Europe'

ALMA/EVLA/eMERLIN software workshop (Oxford, UK; Dec 2-3)

'Advanced Long Baseline iinteroperable User Software'

Linnartz

ISSI meeting (Bern, Switzerland; Jan 07-10)

'New generation of databases for astrochemicalmodelling'

CW meeting (Lunteren, Netherlands; Jan 28-29)

'Theory and spectroscopy'

ISM/CSM meeting (Amsterdam, Netherlands; Apr 21)

Molecular Universe (Arcachon, France; May 05-08)

Infrared plasma spectroscopy meeting (Greifswald, Germany; Jul 23-25)

MOLEC XVII (St. Petersburg, Russia; Aug 24-28)

Interstellar surfaces, from laboratory to models (Leiden, Netherlands; Oct 06-10)

NNV-AMO meeting (Lunteren, Netherlands; Oct 28-29)

ISM/CSM Meeting (Leiden, Netherlands; Nov 7)

Lommen

Dutch ISM/CSM Meeting (Amsterdam, Netherlands; Apr 21)

Nederlandse Astronomenconferentie (Dalhsen, Netherlands; May 7-9)

Dutch ISM/CSM Meeting (Leiden, Netherlands; Nov 7)

Lub

JENAM-AG Tagung (Vienna, Austria; Sep 8-12)

IAU Symposium 258 (Baltimore, USA; Oct 13-17)

'The ages of the Stars'

Van Lunteren

Conference Teaching the History of Science (Gent, Belgium; Feb 6)

'History of Science in the Netherlands'

3rd ESHS Conference (Vienna, Austria; Sep 10-12)

'Dutch culture, science and causality'

Annual Meeting History of Science Society (Pittsburgh, USA; Nov 6 - 9)

'The Metric Convention and its aftermath: rivalries, loyalties and controversies'

Conference 'Nut en nog eens nut?' KNAW (Amsterdam, Netherlands; Nov 27 - 28)

'Eenvoud als ornament; het zelfbeeld van de Nederlandse wetenschap in de negentiende eeuw'

Madigan

MODEST 8a Workshop (Heidelberg, Germany; Mar 12-14)

GSD2008 Conference (Strasbourg, France; Mar 16-20)

Frontiers in Numerical Gravitational Astrophysics (Sicily, Italy; June 27- July 5)

NOVA Fall School (Netherlands Oct 6-10)

Marrese

Gaia Coordination Unit 5 (Barcelona, Spain; Apr 8-9)

'Photometric Processing'

NAC (Dalfsen, The Netherlands; May 7-9)

Gaia Coordination Unit 5 (Edinburgh, UK; Sep 18-19)

'Photometric Processing'

Martinez-Galarza

EARA Workshop (IAP, Paris, France; Feb 18-19)

'Herschel promises on galaxy evolution'

JWST-MIRI European Consortium Meeting (PSI, Villigen, Switzerland; Feb 26-29)

JWST-MIRI Test Team Meeting (RAL, Didcot, United Kingdom; Apr 28-29)

Congreso Colombiano de Astronomia y Astrofisica (Medellin, Colombia; Aug 12-15)

NOVA Fall School (ASTRON, Dwingeloo, Netherlands; Oct 6-10)

MIRI Technical Interchange Meeting (RAL, Didcot, UK; Dec 3)

Masso

Interstellar Surfaces (Leiden, Netherlands; Oct 6-10)

'From Laboratory to Models'

Miley

Workshop on UNawe materials (Lorentz Center, Leiden, Netherlands; Feb 25 - 29)

IAU Regional Meeting (Cairo, Egypt; Mar 4 - 10)

IAU TAD School (Ulan Bator, Mongolia; July 22 - 29)

Workshop on LOFAR Surveys (LC, Leiden, Netherlands; Dec 10 - 13)

Workshop on Science with the EVLA (Socorro, NM, USA; Dec 16 - 18)

De Mooij

IAU symposium 253 (Cambridge, MA, USA; May 19-23)

'Transiting Planets'

Molecules in the Atmospheres of Extrasolar Planets (Paris, France; Nov 19-21)

Öberg

IAU 251 (Hong Kong, China; Feb 18-22)

'Organic Matter in Space'

The Molecular Universe (Arcachon, France; May 5-8)

'An International Meeting on the Physics and Chemistry of the Interstellar Medium'

CW meeting Theory and spectroscopy (Lunteren, Netherlands; Jan 28-29)

ISM/CSM meeting (Amsterdam, Netherlands; Apr 21)

Interstellar surfaces, from laboratory to models (Leiden, Netherlands; Oct 6-10)

NNV-AMO meeting (Lunteren, Netherlands; Oct 28-29)

ISM/CSM Meeting (Leiden, Netherlands; Nov 7)

ISSI meeting (Bern, Switzerland; Dec 02-04)

'New generation of databases for astrochemical modelling'

Oliveira

NOVA School (Dwingeloo, Netherlands; Oct 6-10)

The Ages of Stars (Baltimore, USA; Oct 12-17)

New Light on Young Stars (Pasadena, USA; Oct 26-30)

'Spitzer's View of Circumstellar Disks'

Paardekooper

Dutch Astrophysics Days (Leuven, Belgie; Mar 25-26)

'First Light in the Primordial Gas'

Scientific Writing for Young Astronomers (Blankenberge, Belgie; May 19-21)

Frontiers in Computational Astrophysics: The Origin of Stars, Planets and Galaxies (Ascona, Switzerland; July 13-18)

'Triangulating Radiation: Improvements and New Results of the SimpleX Method'

Cosmological Radiative Transfer Comparison Project Workshop (Austin, Texas, USA; Dec 8-10)

'SimpleX: Radiative Transfer on an Unstructured, Dynamic Grid'

Panič

NAC Annual Meeting (Utrecht, Netherlands; Jan 18)

Early Phase of Planet Formation (Bad Honnef, Germany; Feb 18-22)

Gasps Meeting (Edinburgh, UK; July 17-18)

Pawlik

Nederlandse Astronomen Conferentie (Dalfsen, The Netherlands; May 7-9)

Frontiers in Computational Astrophysics (Ascona, Switzerland; Jul 13-18)

'The Origin of Stars, Planets and Galaxies'

Radiative Transfer Workshop (Austin, Texas, USA; Dec 8-10)

Prod'homme

Gaia Radiation Task Force Meeting (Cambridge, UK; Apr 14-15)

'Theoretical and Empirical Modelling of CTI'

Scientific Writing for Young Astronomers School (Blankenberge, Belgium;

May 18-21)

Gaia Java Workshop (Madrid, Spain; Jun 16-19)

ELSA Workshop on Software Engineering and Numerics (Barcelona, Spain;

Sep 1-5)

'Theoretical and Empirical Modelling of CTI'

Gaia Radiation Task Force Meeting (Cambridge, UK; Oct 6-7)

'New features of CEMGA'

Quadri

The First Two Billion Years of Galaxy Formation (Aspen, USA; Feb 11-15)

Galaxy Evolution from Mass-Selected Samples (Leiden, Netherlands; Jan 28 -

Feb 1)

Galaxies in Real Life and Simulations (Leiden, Netherlands; Sep 15-19)

Risquez

ELSA workshop on Software Engineering and Numerics (Barcelona, Spain;

Sep 1-5)

CU2 Cycle 6 kick-off meeting (Besancon, France; Oct 23-24)

Romanzin

The Molecular Universe (Arcachon, France; May 5-8)

'An international meeting on the Physics and Chemistry of the interstellar medium'

Lorentz center workshop (Leiden, Netherlands; Oct 6-10)

'Interstellar surfaces, from laboratory to models'

32nd Annual Meeting NNV AMO (Lunteren, Netherlands; Oct 28-29)

Röttgering

SKA Ss2 - T1 Meeting (Lisbon, Portugal; Jan 7)

XMM-LSS workshop (Paris, France; Apr 13-16)

'Radio galaxies as tracers of the large scale structure'

Radio Galaxies in the Chandra (Cambridge, MA, Jul 6-10)

'Two distinct accretion processes in radio galaxies.'

Scientific workshop - Astrophysics with E-LOFAR (Hamburg, Germany; Sept 16-19)

'The Survey Key Programme.'

ESO workshop on large programmes (Garching, Germany; Oct 13-15)

Euclid-NIS consortium meeting (Bologna, Italy; Oct 20)

The Starburst-AGN Connection Conference (Shanghai, China, Oct 27-31)

'Two distinct accretion processes in AGN: A multiwavelength study in the XMM-LSS field'

SKA workshop (Dwingeloo, Netherlands; Nov 26-27)

'Extragalactic science with SKA '

The first Science with LOFAR surveys (Leiden, Netherlands; Dec 10-12)

'The survey key programme'

Salter

Sixth IRAM Millimeter Interferometry School (Grenoble, France; Oct 5-9)

Poster Presentation = *'Captured at Millimeter Wavelengths: a Flare from the Classical T Tauri Star DQ Tau'*

Schaye

Galaxy evolution from mass-selected samples (Leiden, Netherlands; Jan 28-Feb 1)

'Progress on simulating galaxy formation'

Theory in the Virtual Observatory (Garching, Germany; Apr 7-11)

'Overwhelmingly Large Simulations' (invited review)

LOFAR EoR science team meeting (Groningen, Netherlands; Apr 15-16)

MUSE science team meeting (Potsdam, Germany; May 28-30)

Far away: Light in the young universe at redshift beyond three (Paris, France; Jul 7-11)

'Star formation and feedback processes at $z > 3$ ' (invited talk)

COSPAR-08: The Interplay between the Interstellar and Intergalactic Media from High Redshifts to the Present (Montreal, Canada; Jul 13-15)

'Simulations and observations of the interaction between galaxies and the intergalactic medium' (invited review)

Galaxies in real life and simulations (Leiden, the Netherlands; Sep 15-19)

'Insights from the Overwhelmingly Large Simulations project'

The Impact of Simulations in Cosmology and Galaxy Formation (Trieste, Italy; Oct 20-22)

'Simulating the formation of galaxies and the evolution of the intergalactic medium' (invited review)

LOFAR EoR science team meeting (Dwingeloo, Netherlands; Nov 11-13)

Schrabback

DUEL Network Meeting (Leiden, Netherlands; Feb 4-6)

Astro-WISE Workshop 2008 (Leiden, Netherlands; Mar 31 - Apr 3)

CFHTLS Systematics Collaboration Meeting (Paris, France; May 28-30)

DUEL Network Meeting (Victoria, Canada; June 25-27)

CFHTLS Systematics Collaboration Meeting (Victoria, Canada; June 27)

OZ Lens 2008 (Sydney, Australia; Sep 29 - Oct 03)

CFHTLS Systematics Collaboration Meeting (Leiden, Netherlands; Nov 20-22)

Serre

MUSE workshop (Frejus, France; June 2-05)

MUSE workshop (Aussois, France; Dec 8-12)

Snellen

LOFAR SETI workshop (Dwingeloo, Netherlands; June 12-13)

Molecules in extrasolar planet atmospheres workshop (Paris, France; Nov 19-21)

The first Science with LOFAR surveys (Leiden, Netherlands; Dec 10-12)

Stuik

SPIE conference on Astronomical Instrumentation, Adaptive Optics System
(Marseille, France; June 23-28)

'ASSIST: The test setup for the VLT AO facility'

The Sloan Digital Sky Survey: From Astroids to Cosmology (Chicago, USA;
Aug 15-18)

Torstensson

ESTRELA Workshop (Dwingeloo, The Netherlands; Jan 15-18)

ESTRELA workshop (Bonn, Germany; Apr 7-11)

NAC (Dalfsen, Netherlands; May 7-9)

YERAC (Gothenburg, Sweden; June 23-26)

9th EVN Symposium (Bologna, Italy; Sep 23-26)

van de Voort

Nederlandse Astronomen Conferentie (Dalfsen, Netherlands; May 7-9)

'Poster (2nd prize poster contest): "Hot and cold accretion in galaxy formation. How does gas enter galaxies?"

Frontiers in computational astrophysics: the origin of stars, planets and galaxies (Ascona, Switzerland; July 13-18)

NOVA fall school (Dwingeloo, Netherlands; Oct 6-10)

Talk: 'Hot and cold accretion'

van der Werf

HerCULES: the Herschel Comprehensive (U)LIRG Emission Survey (Paris, France; Feb 18 - 19)

'The Herschel legacy for galaxy evolution'

Challenges in infrared extragalactic astrophysics (Hersonissos, Crete, Greece; Sep 15 - 19)

'Dense molecular gas in LIRGs and ULIRGs'

The starburst-AGN connection (Shanghai, China; Oct 27 - Nov 1)

'The central parsecs of Cen A: exploring the monster's lair'

van Uitert

The dark side of the Universe through extragalactic gravitational lensing (Leiden, The Netherlands; Feb 4-6)

Shear-measurement workshop (Paris, France; May 28-30)

Upcoming lensing surveys: beyond the obvious (Toronto, Canada; Jun 11-13)

Dark Universe through Extragalactic Lensing (DUEL) workshop (Victoria, Canada; Jun 25-27)

OZ Lens 2008: Dark matter, dark energy and dark ages with gravitational lensing (Sydney, Australia; Sep 29-Oct 3)

Visser

IAU Symposium 251: Organic Matter in Space (Hong Kong, China; Feb 18-22)

'Chemical changes during transport from cloud to disk'

Dutch ISM/CSM Meeting (Amsterdam, the Netherlands; Apr 21)

Dutch ISM/CSM Meeting (Leiden, the Netherlands; Nov 7)

'The chemical history of ices in protoplanetary disks'

Vlahakis

Herschel meeting (IAP Paris, France, Feb 18-19)

Gas and stars in galaxies - a multiwavelength 3D prespective, ESO (Garching, Germany; Jun 9-13)

Cosmic Dust Near and Far (Heidelberg, Germany; Sept 8-12)

Fitting the spectral energy distributions of galaxies (Leiden; Nov 17-21)

Wehres

ISM/CSM Meeting (Amsterdam, Netherlands; Apr 21)

Molecular Universe (Arcachon, France; May 5-8)

Marie Curie Summer School on Laboratory Astrophysics (Boppard, Germany; Aug 27-Sep 01)

Marie Curie Network Meeting (Boppard, Germany, Sep 1-5)

Interstellar Surfaces, From Laboratory to Models (Leiden, Netherlands; Oct 06 -10)

ISM/CSM Meeting (Leiden, Netherlands; Nov 07)

Weijmans

Atlas3D teammeeting (Lyon, France; Feb 18-20)

Galactic Structure and the Structure of Galaxies (Ensenada, Mexico; Mar 17-21)

Gas and Stars in Galaxies: a multi-wavelength 3D perspective (Garching, Germany; June 10-13)

Atlas3D teammeeting (Garching, Germany; Aug 4-6)

Galaxy Evolution: Emerging Insights and Future Challenges (Austin, USA, Nov 11-14)

Atlas3D teammeeting (Saclay, France; Dec 10-12)

Williams

The First Two Billion Years of Galaxy Formation workshop (Aspen, CO, USA; Feb 11-15)

Building the Milky Way workshop (Santa Barbara, CA, USA; Nov 3-4)



Appendix

VII

Observing
sessions

abroad

Sterrewacht
Leiden

Observing sessions abroad

Appendix VII

Holt

TNG (La Palma, Spain; Apr 12-13)

WHT (La Palma, Spain; Apr 14-15)

Israel

IRAM 30m (Granada, Spain; Apr 13-22)

IRAM 30m (Granada, Spain, Augt 6-8)

Kristensen

JCMT (Mauna Kea, Hawaii, USA; June 19-23)

JCMT (Mauna Kea, Hawaii, USA; Oct 20-24)

Kuiper

William Herschel Telescope (La Palma, Spain; Oct 24-28)

Linnartz

NTT 3.5 m (La Silla, Chile; Feb 03-05)

Lommen

ATCA (Narrabri, Australia; Jun 26 - Jul 13)

ATCA (Narrabri, Australia; Jul 27 - Aug 5)

Miley

Australian Telescope (Narrabri, Australia; Sep 3 - 12)

De Mooij

1.5m Telescopio Carlos Sanchez (Tenerife, Spain; May 25 - Jun 1)

4.2m William Herschell Telescope (La Palma, Spain; July 1-3)

Öberg

IRAM 30 m (Pico Veleta, Spain; Mar 20-24)

Oliveira

VLT (Paranal, Chile; Feb 20-26)

Panic

James Clerk Maxwell Telescope (Hawaii, USA; Sep 06-14)

Combined Array for Millimetre Astronomy (California, USA; Sep 22-29)

Quadri

Kitt Peak Observatory 4 m (Tucson, USA; Mar 31 - Apr 6)

Rakic

Keck 10 m (Hawaii, USA; Sep 23-26)

Salter

SMA (Mauna Kea, Hawaii, USA; Mar)

Whitin Observatory, Wellesley College (Wellesley, MA, USA; Dec 19-31)

Snellen

INT 2.5m (La Palma, Spain; May 13-18)

Torstensson

ATCA (Narrabri, Australia; Mar 22-24)

eSMA (Hawaii, USA; July 27-28)

JCMT (Hawaii, USA; July 29-Aug 2)

JCMT (Hilo, HI, USA; June 15-18)

van der Burg

JCMT (Mauna Kea, Hawaii, USA; Nov)

van der Werf

JCMT (Mauna Kea, Hawaii, USA; Apr 16 - 26)

van Dishoeck

APEX (San Pedro, Chile; Nov 9-11)

VLT-CRIRES (Paranal, Chile; Dec 29-31)

Wehres

NTT 3.5 m (La Silla, Chile; Feb 3 - 5)

Weijmans

William Herschel Telescope (La Palma, Spain; Feb 27 - Mar 4)

Williams

NOAO Kitt Peak 4 m (Arizona, USA; Dec 21-25)



Appendix

VIII

Working
visits
abroad

Sterrewacht
Leiden

Working visits abroad

Appendix VIII

Alexander

JILA, University of Colorado (Boulder, CO, USA; 24 Mar-4 Apr)

Institute of Astronomy, University of Cambridge (Cambridge, UK; 8-19 Sep)

Amiri

Working visit (Bonn, Germany; May & Oct)

Bast

Max-Planck-Institut für extraterrestrische Physik (Garching, Germany; Feb 25-29)

Max-Planck-Institut für extraterrestrische Physik (Garching, Germany; May 12-22)

Caltech, (Pasadena, US; Jun 3 - Aug 1)

Caltech, (Pasadena, USA; Oct 10 - Nov 2)

Brandl

MPIA (Heidelberg, Germany; Feb 13-14)

Paul Scherrer Institute (Villigen, Switzerland; Feb 26-29)

Zeiss (Oberkochen, Germany; Apr 14-15)

ESO (Garching, Germany; May 7)

ESO (Garching, Germany; May 20-21)

Onsala Space Observatory (Onsala, Sweden; May 27-30)

CEA Saclay (Saclay, France; June 3)

UK-ATC (Edinburgh, UK; July 23)

MPIA (Heidelberg, Germany; Sep 8-9)

MPE (Garching, Germany; Oct 14-15)

CEA Saclay (Saclay, France; Nov 5)

Rutherford Appleton Lab (Oxford, UK; Dec 2-3)

Busso

Institute of Astronomy (Cambridge, UK; Jul 15-18)

Osservatorio Astronomico "Collurania" (Teramo; Italy, Oct 6-23)

Brinch

Argelander-Institut für Astronomie (Bonn, Germany; Jun 10-12)

Brinchmann

Several visits to CAUP (Porto, Portugal)

Observatoire de Cote d'Azur (Nice, France; Sep 23)

Brown

Trinity College (Dublin, Ireland; Feb 7--8)

Osservatorio Astronomico di Roma (Monte Porzio, Italy; June 24-27)

Cuppen

Ohio State University (Columbus, OH, USA; Sept 21-29)

Max Planck Institute for Astronomy (Heidelberg, Germany; Nov 10-12)

van Dishoeck

MPI für Extraterrestrische Physik (Garching, Germany; Jan 13-27)

ETH (Zürich, Switzerland; Jan 14)

MPI für Extraterrestrische Physik (Garching, Germany; Feb 4-5)

Paul Scherrer Institute (Villigen, Switzerland; Feb 28)

MPI für Extraterrestrische Physik (Garching, Germany; Feb 29-Mar 3)

MPI für Extraterrestrische Physik (Garching, Germany; Mar 17-20)

ETH (Zürich, Switzerland; Mar 25-26)

ESO (Paranal, Chile; Mar 27-29)

APEX (San Pedro, Chile; Mar 30-31)

ALMA offices (Santiago, Chile; Apr 1-4)

MPI für Extraterrestrische Physik (Garching, Germany; Apr 19-29)

University of San Diego (San Diego, USA; May 2)

Annual Reviews (Palo Alto, USA; May 3)

MPI für Extraterrestrische Physik (Garching, Germany; May 10-18)

Onsala Space Observatory (Onsala, Sweden; May 28-29)

Geneva Observatory (Geneva, Switzerland; June 3)

MPI für Extraterrestrische Physik (Garching, Germany; June 7-16)

MPI für Extraterrestrische Physik (Garching, Germany; July 30-Aug 7)

MPI für Extraterrestrische Physik (Garching, Germany; Aug 23-31)

Center for Astrophysics (Cambridge, USA; Sept 9-12)

IAS (Dublin, Ireland; Sept 18)

MPI für Extraterrestrische Physik (Garching, Germany; Sept 26)

MPI für Extraterrestrische Physik (Garching, Germany; Oct 11-19)

California Institute of Technology (Pasadena, USA; Oct 24-26)

APEX (San Pedro, Chile; Nov 8-11)

ALMA offices (San Pedro, Chile; Nov 12-14)

MPI für Extraterrestrische Physik (Garching, Germany; Nov 20-24)

MPI für Extraterrestrische Physik (Garching, Germany; Nov 30-Dec 3)

MPI für Extraterrestrische Physik (Garching, Germany; Dec 16-20)

Franx

Harvard College Observatory (Cambridge, USA; July 26-Aug 8)

University of California (Santa Cruz, USA; May 20-25)

University of California (Santa Cruz, USA; Oct 24)

Yale University (New Haven, USA; May 26-29)

Groves

Observatoire Astronomique de Strasbourg (Strasbourg, France; 3 Feb - 2 Mar 2008)

MPA, Garching, Germany, 14-18 Oct 2008)

Hatch

Institute of Astronomy (Cambridge, UK; Apr 3)

ESO (Garching, Germany; May 6-9)

ESO (Garching, Germany; Aug 1-31)

Hildebrandt

Argelander-Institut für Astronomie (Bonn, Germany; Feb 21-22)

Argelander-Institut für Astronomie (Bonn, Germany; Mar 20)

Institute d'Astrophysique (Paris, France; Apr 9-11)

University of British Columbia (Vancouver, Canada; Jun 23-24)

Royal Observatory (Edinburgh, UK; Aug 4-6)

Argelander-Institut für Astronomie (Bonn, Germany; Aug 7-8)

Argelander-Institut für Astronomie (Bonn, Germany; Nov 24)

Hoekstra

San Francisco State University (San Francisco, USA; Nov 9-11)

University of Victoria (Victoria, Canada; Dec 1-5)

Holt

Isaac Newton Group (La Palma, Spain; Apr 7-17)

Department of Physics & Astronomy, Sheffield University (Sheffield, UK; July 7-11)

Department of Physics & Astronomy, Sheffield University (Sheffield, UK; Nov 10-14)

Israel

Editorial Board European Physics News (Lisbon, Portugal; Oct 4)

Jaffe

European Interferometry Initiative (Porto, Portugal; Mar 9-19)

MPIA (Heidelberg, Germany; Apr 10-11)

ESO (Garching, Germany; Apr 13-16)

European Interferometry Initiative Summer School(Keszthely, Hungary; June 10-13)

MPIfR (Bonn, Germany; June 16-17)

Instituto de Astrofisica de Andalucia (Granada, Spain; Oct 21-22)

MPIA (Heidelberg, Germany; Nov 5-7)

Observatoire de Nice (Nice, France; Nov 19-21)

MPIfR (Bonn, Germany; Dec 14-17)

Jolissaint

In the context of METIS instrument and MUSE instrument studies

Kendrew

Rutherford Appleton Laboratory (Didcot, UK; July 9-11)

Rutherford Appleton Laboratory (Didcot, UK; Sep 18-21)

University of Texas (Austin, USA; Oct 27 - Nov 17)

Kospal

MPIA (Heidelberg, Germany; June 17-21)

MPIA (Heidelberg, Germany; July 21-26)

Kristensen

Observatoire de Paris (Paris, France; July 24-25)

Max Planck Institut fur Radioastronomie (Bonn, Germany; Dec 10-11)

Linnartz

Katholieke Universiteit Leuven (Leuven, Belgium; Jan 22)

IPS Board meeting, INP(Greifswald, Germany; July 25)

CAMOP meeting (St. Petersburg, Russia; Aug 27)

Lommen

UNSW@ADFA (Canberra, Australia; Jul 17-26)

Lub

Astronomy and Astrophysics Board Meeting (Bonn, Germany; May 3)

Marrese

Institute of Astronomy (Cambridge, UK; Jan 29-31)

Institute of Astronomy (Cambridge, UK; July 15-18)

Osservatorio Astronomico "Collurania" (Teramo, Italy; Oct 6-10)

Martinez Galarza

MIRI VM1 Test Campaign (RAL, Didcot, United Kingdom; Jan 22-31)

JWST-MIRI European Consortium Meeting (PSI, Villigen, Switzerland; Feb 26-29)

JWST-MIRI Test Team Meeting (RAL, Didcot, UK; Apr 28-29)

MIRI VM2 Test Campaign (RAL, Didcot, UK; Aug 29-Sep 5)

MIRI VM2 Test Campaign (RAL, Didcot, UK; Sep 13-18)

MIRI VM2 Test Campaign (RAL, Didcot, UK; Sep 24-28)

MIRI wavelength calibration (K.U. Leuven, Leuven, Belgium; Nov 3-7)

Masso

Consejo Superior de Investigaciones Cientificas (Madrid, Spain; Dec 29)

Miley

IAU Strategic Development Brainstorm (IAP, Paris, France; Jan 27- 29)

IAU EC, Norwegian Academy of Sciences (Oslo, Norway; May 15-18)

ERC Advanced Fellowship Committee (Brussels, Belgium; Apr 22-24)

UNAWE Discussions with EU Parliamentarians (EU Brussels, Belgium; 23 June)

ERC Advanced Fellowship Committee (Brussels, Belgium; June 24-26)

Attendance at UNAWE Manifestation and visit to UNAWE-UNESCO Schools (Merida, Venezuela; Nov 16-19)

UNAWE discussions with Venezuelan officials, (Caracas, Venezuela; Nov 20)

Öberg

Max-Planck-Institut für Extraterrestrische Physik (MPE) (Garching, Germany; Oct 13-17)

Cergy-Pontoise University/Observatoire de Paris, (Cergy-Pontoise, France; Sep)

Oliveira

Caltech (Pasadena, USA; Jan 1-Mar 15)

MPE (Garching, Germany; Apr 20-May 15)

Caltech (Pasadena, USA; Oct 20-Nov 7)

Paardekooper

Institute for Computational Cosmology (Durham, UK; Feb 23-Mar 21)

Panic

Max-Planck Institute for Astronomy - MPA, Star-Formation Dept.
(Heidelberg, Germany; Mar 30-Apr 4)

Harvard-Smithsonian Centre for Astrophysics (Boston, USA; Sep 3)

California Institute of Technology (Pasadena, USA; Sep 30)

Pawlik

Caltech (Pasadena, USA; Dec 11-Dec 16)

CfA (Cambridge, USA; Nov 30-Dec 7)

CITA (Toronto, Canada; Nov 2 -Nov 30)

MPA (Garching, Germany; Jan 15-April 15)

Prod'Homme

Institute of Astronomy (Cambridge, England; Mar 25-May 2)

Instituto de Astrofísica (Tenerife, Spain; Aug 7-22)

Institute of Astronomy (Cambridge, England; Sep 29-Oct 10)

Quadri

National Optical Astronomical Observatory (Tucson, USA; Mar 27-30)

Yale University (New Haven, USA; Jun 16-July 4)

Yale University (New Haven, USA; Aug 4-8)

Yale University (New Haven, USA; Nov 17-21)

Rakic

Caltech (Pasadena, US, Jan 18-Feb 4, Sep 13-Sep 22; Sep 27-Oct 3)

Risquez

Institute of Astronomy (Cambridge, UK; Aug 11-15)

Institute of Astronomy (Cambridge, UK; Nov 9-22)

Röttgering

Royal Observatory, (Edinburgh, Scotland; Jan 17-19)

Spitzer Tag (Pasadena, USA; Feb 11-13)

Centre for Astrophysics, Science & Technology Research

Institute (Hertfordshire, UK; Mar 26-27)
ESO-OPC (Garching, Germany; May 25-30)
ESO-OPC (Garching, Germany; Nov 17-21)

Salter

Wellesley College (Wellesley, MA, USA; Dec 19-31)

Schaye

Institute for Advanced Study (Princeton, USA; Feb 20-29)
Max Planck Institute for Astrophysics (Garching, Germany; Aug 18-19)

Schrabback

Bonn University (Bonn, Germany; Feb 14-15)
KIPAC (Stanford, USA; Sep 25-26)

Serre

Centre de Recherche Astrophysique de Lyon (Lyon, France; Nov 06-07)
Laboratoire d'Astrophysique de Toulouse-Tarbes (Toulouse, France; Nov 12-19)

Stuik

Astronomy and Astrophysics Department, UChicago (Chicago, USA; Jan 1 - Jan 13)
ESO (Garching, Germany; Jan 24)
Astronomy and Astrophysics Department, UChicago (Chicago, USA; Feb 9 - Feb 24)
Astronomy and Astrophysics Department, UChicago (Chicago, USA; Mar 13 - 31)
Stuik Astronomy and Astrophysics Department, UChicago (Chicago, USA; Apr 17 - May 4)
Astronomy and Astrophysics Department, UChicago (Chicago, USA; May 17 - 30)
CRAL Conference Center (Frejus, France; June 2 - 5)
Astronomy and Astrophysics Department, UChicago (Chicago, USA; July 2 - Aug 2)
Rayleigh Optical Corporation, Baltimore, USA; July 8)
Astronomy and Astrophysics Department, UChicago (Chicago, USA; Aug 14 - Sep 16)
ESO (Garching, Germany; Sep 24 - 26)
Observatoire de Lyon (Lyon, France; Oct 14-15)
Astronomy and Astrophysics Department, UChicago (Chicago, USA; Oct 18 - Nov 3)

Saclay (Gif-sur-Yvette, France; Nov 5)
AMOS (Liege, Belgium; Nov 18)
Astronomy and Astrophysics Department, UChicago (Chicago, USA; Nov 21 - Dec 6)
Observatoire de Lyon (Lyon, France; Dec 17-20)
Astronomy and Astrophysics Department, UChicago (Chicago, USA; Dec 20 - 31)

Torstensson

ATNF (Sydney, Australia; Mar 24-28)
Jodrell Bank Centre for Astrophysics (Manchester, UK; Sept 3-Dec 18)

Van Uiter

University of Victoria (Victoria, Canada; Mar 18-Apr 1)
University of Victoria (Victoria, Canada; Jun 14-Jul 19)

Visser

Denison University (Granville, Ohio, USA; Jan. 17-Feb. 1)
MPE (Garching, Germany; June 9-13)
MPE (Garching, Germany; Oct. 14-17)

Vlahakis

ESO (Santiago, Chile; Jan 2-Feb 2)
ESO (Santiago, Chile; Apr 7-Apr 25)

Wehres

Katholieke Universiteit Leuven (Leuven; Belgium, Jan 21-22)
Katholieke Universiteit Leuven (Leuven; Belgium, Apr 28-May 01)
Katholieke Universiteit Leuven (Leuven; Belgium, Jul 14-18)

van der Werf

Rutherford Appleton Laboratory (Chilton, England, UK; Jan 30-31)
Max-Planck-Institut fuer Astronomie (Heidelberg, Germany; Feb 12-13)
Cardiff University (Cardiff, Wales, UK; Mar 12-14)
Universite Laval (Quebec City, Canada; June 3-4)
University College London (London, England, UK; June 16)
European Southern Observatory (Garching, Germany; Oct 15)
NRAO - Very Large Array (Socorro NM, USA; Dec 8-9)
Joint Astronomy Center (Hilo HI, USA; Dec 11-12)


Weijmans

IAS (Princeton, USA; Jan 7-11)

ESO (Garching, Germany; Feb 4-8)
University of Oxford (Oxford, UK; Apr 21-25)
University of Durham (Durham, UK; Apr 28 - May 1)
ESO (Garching, Germany; June 16-20)
ESO (Garching, Germany; Aug 7-8)
ESO (Garching, Germany; Oct 20-24)

Williams

ESO (Garching, Germany; March 4-18)
Yale University (New Haven, CT, USA; June 15-29)
Ohio State University (Columbus, OH, USA; June 30-July 3)



Appendix **IX**

Colloquia
given

outside Leiden

Sterrewacht
Leiden

Colloquia given outside Leiden

Appendix IX

Beirao

Spectral Mapping of the Central Regions of M82

Nederlands Astronomen Conferentie, Dalfsen, Netherlands; May 7-9

Brandl

History, Technology, and Science of the Spitzer Space Telescope

NAC annual meeting, Utrecht, Netherlands; Jan 18

Instruments under Study for the E-ELT, in particular METIS

BICEAI meeting Brussels, Belgium; Feb 22

Brinch

Argelander-Institut für Astronomie

Bonn, Germany; Jan 31

Brinchmann

Wolf-Rayet galaxies - a survey using the SDSS

CAUP, Porto, Portugal; Apr 30

Wolf-Rayet galaxies at high and low redshift: When individual stars make an impact on their galaxies

IAP, Paris, France; Oct 10

Brown

Gaia - Taking the Galactic Census

Trinity College, Dublin, Ireland; Feb 7

Radiation damage effects and their management for the Gaia mission

ASTRON, Dwingeloo, Netherlands; Jun 5

Busso

Crowding Evaluation for BP/RP

Institute for Astronomy, Edinburgh, UK; Sep 18

Cuppen

Surface processes on interstellar grains

Max Planck Institute for Astronomy, Germany; Nov 11

Kinetics of surface processes

Institute for Chemistry, Leiden, Netherlands; June 4

van Dishoeck

VLT-CRIRES observations of protoplanetary disks: where is the gas inside gaps?

European Southern Observatory, Garching, Germany; January 22

Building planets and the ingredients of life between the stars (Niels Bohr lecture)

University of Copenhagen, Copenhagen, Denmark; April 23

Gas and dust evolution in protoplanetary disks

University of Copenhagen, Copenhagen, Denmark; April 24

Gas and dust evolution in protoplanetary disks

University of San Diego, San Diego, USA; May 2

Gas and dust evolution in protoplanetary disks

Geneva Observatory, Geneva, Switzerland; June 3

Groves

Observatoire Astronomique de Strasbourg

Strasbourg, France; Feb 21

Astronomy Dept. Sheffield University

Sheffield, UK; May 21

Astrophysics Research Institute, Liverpool John Moores University

Liverpool, UK; Dec 3

Hildebrandt

Public Release of the GaBoDS - ESO Deep Public Survey WFI Data with ADP

Garching, Germany; Apr 15

Measurements of halo masses at high redshift using Lyman-break galaxy clustering

Groningen, Netherlands; June 4

PHAT - recent developments & future plans

Victoria, Canada; June 25

Turning galaxy clustering at high-z into a precision tool

Edinburgh, UK; Aug 4

Activities within PHAT

London, UK; Sep 15

PHAT - PHoto-z Accuracy Testing
Pasadena, USA; Dec 3

Hoekstra

Lensing by large scale structure
San Francisco State University, USA; Nov 10

Hogerheijde

Resolving the molecular gas in protoplanetary disks
Nijmegen, Netherlands; Apr 3

Holt

Emission line outflows - the evidence for AGN-induced feedback
ING, La Palma, Spain; April 16

Hopman

Stellar dynamics near massive black holes
Nijmegen, Netherlands; Nov 18

Icke

Radiation hydrodynamics of binary stars
Leuven, Belgium, Mar 26
Communicating Science NOVA Autumn School
Dwingeloo, Netherlands; Oct 7

Johansen

Planetesimal formation in turbulent protoplanetary discs
UC Berkeley, USA; Mar 26

Linnartz

Evening lecture Analytical Chemistry
Lunteren, Netherlands
General physics colloquium RUG
Groningen, Netherlands; Nov 27

Lommen

ATNF
Sydney, Australia; Jul 22

van Lunteren

Wetenschap en cultuur
Huizinga Instituut, Amsterdam, Netherlands; Apr 6

Determinisme en vrijheid rond 1900

Metamedica, VU, Amsterdam, Netherlands; Apr 23

Frederik Kaiser als popularisator

Kaiser Symposium, Museum Boerhaave, Leiden, Netherlands; June 10

Marrese

Chromaticity and BP/RP shape parameters Institute for Astronomy

Edinburgh, UK; Sep 18

Miley

Probing the Early Universe with Radio Galaxies

Ulan Bator, Mongolia; July 28

Idem

CIDA, Merida, Venezuela; Nov 19

Öberg

From Dust to Gas: The History of Interstellar Ices from Cloud Cores to Protoplanetary Disks

ESA-Estec, Noordwijk, The Netherlands; June 6

Oliveira

Disk Evolution in Serpens

Yale University, Yale; Jan 17

Paardekooper

SimpleX: Radiative Transfer on an Unstructured, Dynamic Grid LANL

Los Alamos, New Mexico, USA; Dec 17

Panic

Gas and Dust Distribution in Discs around Young Low-Mass Stars

Royal Observatory Edinburgh, Edinburgh, UK; July 17

Idem

Harvard-Smithsonian Centre for Astrophysics, Boston, USA; Sep 3

Idem

Institute for Astronomy, University of Hawaii Honolulu, USA; Sep 17

Idem

California Institute of Technology Pasadena, USA; Sep 30

Pawlik

TRAPHIC - Radiative Transfer for Smoothed Particle Hydrodynamics MPA

Garching, Germany; Apr 1

Cosmic Reionization Simulations
CITA Toronto, Canada; Nov 27
Cosmic Reionization Simulations
CfA Cambridge, USA; Dec 5
Cosmic Reionization Simulations Caltech
Pasadena, USA; Dec 16

Prod'homme

Theoretical and Empirical Modelling of CTI
Cambridge, UK; Apr 14
Theoretical and Empirical Modelling of CTI
Dwingeloo, Netherlands; Jun 5
Theoretical and Empirical Modelling of CTI
Barcelona, Spain; Sep 1
New features of CEMGA
Cambridge, UK; Oct 6

Röttgering

LOFAR: Opening up a new window on the Universe
Bonn, Germany; Jan 24-25
Idem
Meudon, France; Jun 1
Idem
Geneva, Switzerland; Nov 11
Idem
Berkeley USA; Feb 8
Idem
Sussex, UK; Jun 6

Salter

Captured at millimeter wavelengths: a flare from the Classical T Tauri star DQ Tau
CfA, Cambridge, MA, USA; Dec 19

Schaye

First results from OWLS: the Overwhelmingly Large Simulations project
Institute for Advanced Study, Princeton, USA; Feb 26
First results from OWLS: the Overwhelmingly Large Simulations project
New York University, New York, USA; Feb 28
Simulating the formation of galaxies
Joint ESO/MPA/MPE, Garching, Germany; Oct 9

Schrabback

Measuring Cosmological Weak Lensing using HST/ACS Bonn University

Bonn, Germany; Feb 15

Constraining the ellipticity of galaxy-scale dark matter haloes with weak lensing in the HST/COSMOS Survey KIPAC

Stanford, USA; Sep 26

Snellen

Transiting extrasolar planets

Groningen, Netherlands; Feb 4

Torstensson

What is brewing at the sites of methanol masers

Bonn, Germany; Apr 8

The 6.7 GHz methanol maser in Cepheus A

Gothenburg, Sweden; June 24

Methanol masers in Cepheus A

Bologna, Italy; Sept 24

van der Werf

How do starburst galaxies work?

Kapteyn Institute, Groningen, Netherlands; Nov 10

Visser

Gas and ice during low-mass star formation

Denison University, Granville, Ohio, USA; Jan 28

Vlahakis

Dust in nearby galaxies

ESO, Santiago, Chile; Jan 23

The Sombrero galaxy's dust ring

ESO, Santiago, Chile; Apr 25

Weijmans

Dark matter in early-type galaxies: a SAURON view

STScI, Baltimore, USA; Oct 31

University of Princeton, USA; Nov 3

CITA, Toronto, Canada; Nov 7

University of California, Santa Cruz, USA; Nov 17

Herzberg Institute, Victoria, Canada; Nov 20

Williams

Warm-Hot Baryons at $z=0$

ESO, Garching, Germany; Mar 12

"Dead and Alive" Galaxy Populations to $z=2.5$

ESO, Garching, Germany; Mar 18

The Evolution of Quiescent Galaxies over 11 Gyr CfA

Cambridge, MA, USA; Oct 24

Idem

Princeton, NJ, USA; Oct 27

Idem

Johns Hopkins, Baltimore, MD, USA; Oct 28

Idem

Carnegie Observatories, Pasadena, CA, USA; Oct 31

Idem

Univ. of California, Santa Cruz, CA, USA; Nov 6

Idem

Univ. of California, Berkeley, CA, USA; Nov 7

Idem

Univ. of Hawaii, Honolulu, HI, USA; Nov 13



Appendix **X**

Scientific
publications

Sterrewacht
Leiden

Scientific publications

Appendix X

X.1. Ph.D. Theses and Books

S. Albrecht, Stars and planets at high spatial and spectral resolution, Ph.D. thesis, Leiden University, December 2008.

D. Baneke, Synthetisch denken. Natuurwetenschappers over hun rol in een moderne maatschappij 1900-1940 (Uitgeverij Verloren, Hilversum, 2008).

C. Brinch, The evolving velocity field around protostars, Ph.D. thesis, Leiden University, October 2008.

D. van Delft, De telescoop; erfenis van een Nederlandse uitvinding (Bert Bakker, Amsterdam, 2008).

D. van Delft, Jacht op het absolute nulpunt; ontdekkingsreizen in de wereld van de zeer lage temperaturen (Bert Bakker, Amsterdam, 2008).

D. van Delft, J. Polak, Eene verzameling ontplofbare toestellen: de juridische strijd van Kamerlingh Onnes om de koudste plek op aarde (Kluwer, Alphen a/d Rijn, 2008).

D. H. F. M. Schnitzeler, Faraday tomography of the galactic ISM with the WSRT, Ph.D. thesis, Leiden University, May 2008.

C. Tasse, Host galaxies and environment of active galactic nuclei. A study of the XMM large scale structure survey, Ph.D. thesis, Leiden University, January 2008.

R. C. E. van den Bosch , Giant elliptical galaxies. Kinematically de-coupled cores and massive black holes, Ph.D. thesis, Leiden University, September 2008.

T. A. van Kempen , Probing protostars. The physical structure of gas and dust during low-mass star formation, Ph.D. thesis, Leiden University, October 2008.

L. van Starckenburg , Dynamics of high redshift disk galaxies, December 2008.

X.2. Articles in Refereed Journals

K. Acharyya, G. W. Fuchs, H. J. Fraser, E. F. van Dishoeck, and H. Linnartz, Desorption of CO and O₂ interstellar ice analogs, *Astron. Astrophys.* **466**, 1005–1012.

A. Aguirre, C. Dow-Hygelund, **J. Schaye**, and T. Theuns, Metallicity of the Intergalactic Medium using Pixel Statistics. IV. Oxygen, *Astrophys. J.* **689**, 851–864.

J. M. Alcalá, L. Spezzi, N. Chapman, N. J. Evans, II, T. L. Huard, J. K. Jørgensen, **B. Merín**, K. R. Stapelfeldt, E. Covino, A. Frasca, D. Gandolfi, and **I. Oliveira**, The Spitzer c2d Survey of Large, Nearby, Interstellar Clouds. X. The Chamaeleon II Pre-Main-Sequence Population as Observed with IRAC and MIPS, *Astrophys. J.* **676**, 427–463.

R. Alexander, From discs to planetesimals: Evolution of gas and dust discs, *New Astronomy Review* **52**, 60–77.

R. D. Alexander, [NeII] emission-line profiles from photoevaporative disc winds, *Monthly Notices Roy. Astr. Soc.* **391**, L64–L68.

R. D. Alexander, P. J. Armitage, and J. Cuadra, Binary formation and mass function variations in fragmenting discs with short cooling times, *Monthly Notices Roy. Astr. Soc.* **389**, 1655–1664.

R. D. Alexander, P. J. Armitage, J. Cuadra, and M. C. Begelman, Self-Gravitating Fragmentation of Eccentric Accretion Disks, *Astrophys. J.* **674**, 927-935.

M. G. Allen, **B. A. Groves**, M. A. Dopita, R. S. Sutherland, and L. J. Kewley, The MAPPINGS III Library of Fast Radiative Shock Models, *Astrophys. J. Suppl* **178**, 20-55.

S. Andersson and **E. F. van Dishoeck**, Photodesorption of water ice. A molecular dynamics study, *Astron. Astrophys.* **491**, 907-916.

T. Arentoft, H. Kjeldsen, T. R. Bedding, M. Bazot, J. Christensen-Dalsgaard, T. H. Dall, C. Karoff, F. Carrier, P. Eggenberger, D. Sosnowska, R. A. Wittenmyer, M. Endl, T. S. Metcalfe, **S. Hekker**, S. Reffert, R. P. Butler, H. Bruntt, L. L. Kiss, S. J. O'Toole, E. Kambe, H. Ando, H. Izumiura, B. Sato, M. Hartmann, A. Hatzes, F. Bouchy, B. Mosser, T. Appourchaux, C. Barban, G. Berthomieu, R. A. Garcia, E. Michel, J. Provost, S. Turck-Chièze, M. Martić, J.-C. Lebrun, J. Schmitt, J.-L. Bertaux, A. Bonanno, S. Benatti, R. U. Claudi, R. Cosentino, S. Leccia, S. Frandsen, K. Brogaard, L. Glowienka, F. Grundahl, and E. Stempels, A Multisite Campaign to Measure Solar-like Oscillations in Procyon. I. Observations, Data Reduction, and Slow Variations, *Astrophys. J.* **687**, 1180-1190.

A. Bartkiewicz, A. Brunthaler, M. Szymczak, **H. J. van Langevelde**, and M. J. Reid, The nature of the methanol maser ring G23.657-00.127. I. The distance through trigonometric parallax measurements, *Astron. Astrophys.* **490**, 787-792.

P. Beirão, **B. R. Brandl**, P. N. Appleton, B. Groves, L. Armus, N. M. Förster Schreiber, J. D. Smith, V. Charmandaris, and J. R. Houck, Spatially Resolved Spitzer IRS Spectroscopy of the Central Region of M82, *Astrophys. J.* **676**, 304-316.

R. G. Berkhout and **Y. Levin**, Evolution of the bursting-layer wave during a type I X-ray burst, *Monthly Notices Roy. Astr. Soc.* **385**, 1029-1035.

S. Bertone, **J. Schaye**, and K. Dolag, Numerical Simulations of the Warm-Hot Intergalactic Medium, *Space Science Reviews* **134**, 295-310.

S. E. Bisschop, J. K. Jørgensen, T. L. Bourke, **S. Bottinelli**, and **E. F. van Dishoeck**, An interferometric study of the low-mass protostar IRAS 16293-2422: small scale organic chemistry, *Astron. Astrophys.* **488**, 959-968.

G. A. Blanc, P. Lira, L. F. Barrientos, P. Aguirre, H. Francke, **E. N. Taylor**, **R. Quadri**, D. Marchesini, L. Infante, E. Gawiser, P. B. Hall, J. P. Willis, D. Herrera, and J. Maza, The Multiwavelength Survey by Yale-Chile (MUSYC): Wide K-Band Imaging, Photometric Catalogs, Clustering, and Physical Properties of Galaxies at $z \sim 2$, *Astrophys. J.* **681**, 1099-1115.

C. Boersma, J. Bouwman, **F. Lahuis**, C. van Kerckhoven, A. G. G. M. Tielens, L. B. F. M. Waters, and T. Henning, The characteristics of the IR emission features in the spectra of Herbig Ae stars: evidence for chemical evolution, *Astron. Astrophys.* **484**, 241-249.

A. C. A. Boogert, K. M. Pontoppidan, C. Knez, **F. Lahuis**, J. Kessler-Silacci, **E. F. van Dishoeck**, G. A. Blake, J.-C. Augereau, **S. E. Bisschop**, **S. Bottinelli**, T. Y. Brooke, J. Brown, **A. Crapsi**, N. J. Evans, II, H. J. Fraser, **V. Geers**, T. L. Huard, J. K. Jørgensen, **K. I. Öberg**, L. E. Allen, P. M. Harvey, D. W. Koerner, L. G. Mundy, D. L. Padgett, A. I. Sargent, and K. R. Stapelfeldt, The c2d Spitzer Spectroscopic Survey of Ices around Low-Mass Young Stellar Objects. I. H₂O and the 5-8 μ m Bands, *Astrophys. J.* **678**, 985-1004.

R. J. Bouwens, G. D. Illingworth, **M. Franx**, and H. Ford, $z \sim 7$ -10 Galaxies in the HUDF and GOODS Fields: UV Luminosity Functions, *Astrophys. J.* **686**, 230-250.

H. Bouy, N. Huélamo, C. Pinte, J. Olofsson, D. Barrado Y, Navascués, E. L. Martín, E. Pantin, J.-L. Monin, G. Basri, J.-C. Augereau, F. Ménard, G. Duvert, G. Duchêne, F. Marchis, A. Bayo, **S. Bottinelli**, B. Lefort, and S. Guieu, Structural and compositional properties of brown dwarf disks: the case of 2MASS J04442713+2512164, *Astron. Astrophys.* **486**, 877-890.

M. Bradač, **T. Schrabback**, T. Erben, M. McCourt, E. Million, A. Mantz, S. Allen, R. Blandford, A. Halkola, **H. Hildebrandt**, M. Lombardi, P. Marshall, P. Schneider, T. Treu, and J.-P. Kneib, Dark Matter and Baryons in the X-Ray Luminous Merging Galaxy Cluster RX J1347.5-1145, *Astrophys. J.* **681**, 187-196.

L. D. Bradley, R. J. Bouwens, H. C. Ford, G. D. Illingworth, M. J. Jee, N. Benítez, T. J. Broadhurst, **M. Franx**, B. L. Frye, L. Infante, V. Motta, P. Rosati, R. L. White, and W. Zheng, Discovery of a Very Bright Strongly Lensed Galaxy Candidate at $z \sim 7.6$, *Astrophys. J.* **678**, 647-654.

C. Brinch, **M. R. Hogerheijde**, and S. Richling, Characterizing the velocity field in hydrodynamical simulations of low-mass star formation using spectral line profiles, *Astron. Astrophys.* **489**, 607-616.

- C. Brinch, R. J. van Weeren, and M. R. Hogerheijde**, Time-dependent CO depletion during the formation of protoplanetary disks, *Astron. Astrophys.* **489**, 617-625.
- J. Brinchmann**, D. Kunth, and F. Durret, Galaxies with Wolf-Rayet signatures in the low-redshift Universe. A survey using the Sloan Digital Sky Survey, *Astron. Astrophys.* **485**, 657-677.
- M. H. Brookes, P. N. Best, J. A. Peacock, **H. J. A. Röttgering**, and J. S. Dunlop, A Combined EIS-NVSS Survey Of Radio Sources (CENSORS) - III. Spectroscopic observations, *Monthly Notices Roy. Astr. Soc.* **385**, 1297-1326.
- C. N. Cardamone, C. M. Urry, **M. Damen**, P. van Dokkum, E. Treister, I. Labbé, S. N. Virani, P. Lira, and E. Gawiser, Mid-Infrared Properties and Color Selection for X-Ray-Detected Active Galactic Nuclei in the MUSYC Extended Chandra Deep Field-South, *Astrophys. J.* **680**, 130-142.
- P. Caselli, C. Vastel, C. Ceccarelli, F. F. S. van der Tak, **A. Crapsi**, and A. Bacmann, Survey of ortho-H₂D⁺ (1_{1,0}-1_{1,1}) in dense cloud cores, *Astron. Astrophys.* **492**, 703-718.
- D. M. Clark, S. S. Eikenberry, **B. R. Brandl**, J. C. Wilson, J. C. Carson, C. P. Henderson, T. L. Hayward, D. J. Barry, A. F. Ptak, and E. J. M. Colbert, A First Estimate of the X-Ray Binary Frequency as a Function of Star Cluster Mass in a Single Galactic System, *Astrophys. J.* **678**, 798-803.
- A. Crapsi, E. F. van Dishoeck, M. R. Hogerheijde, K. M. Pontoppidan, and C. P. Dullemond**, Characterizing the nature of embedded young stellar objects through silicate, ice and millimeter observations, *Astron. Astrophys.* **486**, 245-254.
- S. Croft, W. van Breugel, M. J. I. Brown, W. de Vries, A. Dey, P. Eisenhardt, B. Jannuzi, **H. Röttgering**, S. A. Stanford, D. Stern, and S. P. Willner, Radio-Loud High-Redshift Protogalaxy Candidates in BOÖTES, *Astron. J.* **135**, 1793-1802.
- J. Cuadra, P. J. Armitage, and **R. D. Alexander**, Stellar dynamical evidence against a cold disc origin for stars in the Galactic Centre, *Monthly Notices Roy. Astr. Soc.* **388**, L64-L68.
- H. M. Cuppen** and L. Hornekaer, Kinetic Monte Carlo studies of hydrogen abstraction from graphite, *Journal of Chemical Physics* **128**, 174707.

C. Dalla Vecchia and **J. Schaye**, Simulating galactic outflows with kinetic supernova feedback, *Monthly Notices Roy. Astr. Soc.* **387**, 1431-1444.

J. T. A. de Jong, **K. H. Kuijken**, and **P. Héraudeau**, Ground-based variability surveys towards Centaurus A: worthwhile or not?, *Astron. Astrophys.* **478**, 755-762.

A. R. Duffy, **J. Schaye**, S. T. Kay, and **C. Dalla Vecchia**, Dark matter halo concentrations in the Wilkinson Microwave Anisotropy Probe year 5 cosmology, *Monthly Notices Roy. Astr. Soc.* **390**, L64-L68.

M. M. Dunham, **A. Crapsi**, N. J. Evans, II, T. L. Bourke, T. L. Huard, P. C. Myers, and J. Kauffmann, Identifying the Low-Luminosity Population of Embedded Protostars in the c2d Observations of Clouds and Cores, *Astrophys. J. Suppl. Ser.* **179**, 249-282.

B. H. C. Emonts, R. Morganti, T. A. Oosterloo, **J. Holt**, C. N. Tadhunter, J. M. van der Hulst, R. Ojha, and E. M. Sadler, Enormous disc of cool gas surrounding the nearby powerful radio galaxy NGC612 (PKS0131-36), *Monthly Notices Roy. Astr. Soc.* **387**, 197-208.

G. J. Ferland, A. C. Fabian, **N. A. Hatch**, R. M. Johnstone, R. L. Porter, P. A. M. van Hoof, and R. J. R. Williams, The origin of molecular hydrogen emission in cooling-flow filaments, *Monthly Notices Roy. Astr. Soc.* **386**, L72-L76.

D. J. E. Floyd, D. Axon, S. Baum, A. Capetti, M. Chiaberge, D. Macchetto, J. Madrid, **G. Miley**, C. P. O'Dea, E. Perlman, A. Quillen, W. Sparks, and G. Tremblay, Hubble Space Telescope Near-infrared Snapshot Survey of 3CR Radio Source Counterparts. II. An Atlas and Inventory of the Host Galaxies, Mergers, and Companions, *Astrophys. J. Suppl. Ser.* **177**, 148-173.

H. Francke, E. Gawiser, P. Lira, E. Treister, S. Virani, C. Cardamone, C. M. Urry, P. van Dokkum, and **R. Quadri**, Clustering of Intermediate-Luminosity X-Ray-Selected Active Galactic Nuclei at $z \sim 3$, *Astrophys. J. Lett.* **673**, L13-L16.

M. Franx, P. G. van Dokkum, N. M. F. Schreiber, **S. Wuyts**, I. Labbé, and S. Toft, Structure and Star Formation in Galaxies out to $z = 3$: Evidence for Surface Density Dependent Evolution and Upsizing, *Astrophys. J.* **688**, 770-788.

A. Gáspár, K. Y. L. Su, G. H. Rieke, Z. Balog, I. Kamp, **J. R. Martínez-Galarza**, and K. Stapelfeldt, Modeling the Infrared Bow Shock at δ Velorum:

Implications for Studies of Debris Disks and λ Boötis Stars, *Astrophys. J.* **672**, 974-983.

A. Ballast, A. Gijsbertsen, **H. Linnartz**, S. Stolte, The quasi quantum treatment of rotationally inelastic scattering from a hard shell potential: its derivation and practical use, *Mol. Phys.* **106**, 315-331

B. Groves, M. A. Dopita, R. S. Sutherland, L. J. Kewley, J. Fischera, C. Leitherer, **B. Brandl**, and W. van Breugel, Modeling the Pan-Spectral Energy Distribution of Starburst Galaxies. IV. The Controlling Parameters of the Starburst SED, *Astrophys. J. Suppl. Ser.* **176**, 438-456.

B. Groves, **B. Neffs**, and **B. Brandl**, The mid-infrared [SIV]/[NeII] versus [NeIII]/[NeII] correlation, *Monthly Notices Roy. Astr. Soc.* **391**, L113-L116.

M. R. Haas, M. Gieles, R. A. Scheepmaker, S. S. Larsen, and H. J. G. L. M. Lamers, ACS imaging of star clusters in M 51. II. The luminosity function and mass function across the disk, *Astron. Astrophys.* **487**, 937-949.

A. Halkola, H. Hildebrandt, T. Schrabback, M. Lombardi, M. Bradač, T. Erben, P. Schneider, and D. Wuttke, The mass distribution of RX J1347-1145 from strong lensing, *Astron. Astrophys.* **481**, 65-77.

P. M. Harvey, T. L. Huard, J. K. Jørgensen, R. A. Gutermuth, E. E., Mamajek, T. L. Bourke, **B. Merín**, L. Cieza, T. Brooke, N. Chapman, J. M. Alcalá, L. E. Allen, N. J. Evans, II, J. Di Francesco, and J. M. Kirk, The Spitzer Survey of Interstellar Clouds in the Gould Belt. I. IC 5146 Observed With IRAC and MIPS, *Astrophys. J.* **680**, 495-516.

N. A. Hatch, R. A. Overzier, H. J. A. Röttgering, J. D. Kurk, and **G. K. Miley**, Diffuse UV light associated with the Spiderweb Galaxy: evidence for in situ star formation outside galaxies, *Monthly Notices Roy. Astr. Soc.* **383**, 931-942.

S. Hekker, **I. A. G. Snellen**, C. Aerts, A. Quirrenbach, S. Reffert, and D. S. Mitchell, Precise radial velocities of giant stars. IV. A correlation between surface gravity and radial velocity variation and a statistical investigation of companion properties, *Astron. Astrophys.* **480**, 215-222.

H. Hildebrandt, C. Wolf, and N. Benítez, A blind test of photometric redshifts on ground-based data, *Astron. Astrophys.* **480**, 703-714.

T. M. Ho, R. Schulz, C. Erd, D. Martin, T. Oosterbroek, A. Peacock, A. Stankov, **J. A. Stuwe**, P. Verhoeve, 73P/Schwassmann-Wachmann 3-B observed from the optical ground station, *Astron. Astrophys.* **477**, 299-308

J. Holt, C. N. Tadhunter, and R. Morganti, Fast outflows in compact radio sources: evidence for AGN-induced feedback in the early stages of radio source evolution, *Monthly Notices Roy. Astr. Soc.* **387**, 639-659.

A. M. Hughes, D. J. Wilner, I. Kamp, and **M. R. Hogerheijde**, A Resolved Molecular Gas Disk around the Nearby A Star 49 Ceti, *Astrophys. J.* **681**, 626-635.

A. M. Hughes, D. J. Wilner, C. Qi, and **M. R. Hogerheijde**, Gas and Dust Emission at the Outer Edge of Protoplanetary Disks, *Astrophys. J.* **678**, 1119-1126.

K. J. Inskip, M. Villar-Martín, C. N. Tadhunter, R. Morganti, **J. Holt**, and D. Dicken, PKS2250-41: a case study for triggering, *Monthly Notices Roy. Astr. Soc.* **386**, 1797-1810.

S. Ioppolo, **H. M. Cuppen**, **C. Romanzin**, **E. F. van Dishoeck**, and **H. Linnartz**, Laboratory Evidence for Efficient Water Formation in Interstellar Ices, *Astrophys. J.* **686**, 1474-1479.

F. P. Israel, **D. Raban**, R. S. Booth, and F. T. Rantakyro, The millimeter-wave continuum spectrum of Centaurus A and its nucleus, *Astron. Astrophys.* **483**, 741-748.

D. Ityaksov, **H. Linnartz**, W. Ubachs, Deep-UV absorption and Rayleigh scattering of carbon dioxide, *Chem. Phys. Lett.* **462**, 31-34.

D. Ityaksov, **H. Linnartz**, W. Ubachs, Deep-UV absorption and Rayleigh scattering of N₂, CH₄ and SF₆, *Mol. Phys.* **106**, 2471-2479.

V. Jelić, S. Zaroubi, P. Labropoulos, R. M. Thomas, G. Bernardi, M. A. Brentjens, A. G. de Bruyn, B. Ciardi, G. Harker, L. V. E. Koopmans, V. N. Pandey, **J. Schaye**, and S. Yatawatta, Foreground simulations for the LOFAR-epoch of reionization experiment, *Monthly Notices Roy. Astr. Soc.* **389**, 1319-1335.

A. Johansen, F. Brauer, C. Dullemond, H. Klahr, and T. Henning, A coagulation-fragmentation model for the turbulent growth and destruction of preplanetesimals, *Astron. Astrophys.* **486**, 597-611.

A. Johansen and Y. Levin, High accretion rates in magnetised Keplerian discs mediated by a Parker instability driven dynamo, *Astron. Astrophys.* **490**, 501-514.

J. S. Kaastra, A. M. Bykov, S. Schindler, J. A. M. Bleeker, S. Borgani, A. Diaferio, K. Dolag, F. Durret, J. Nevalainen, T. Ohashi, F. B. S. Paerels, V. Petrosian, Y. Rephaeli, P. Richter, **J. Schaye**, and N. Werner, Clusters of Galaxies: Beyond the Thermal View, *Space Science Reviews* **134**, 1-4.

K. K. Knudsen, **P. P. van der Werf**, and J.-P. Kneib, Probing the submillimetre number counts at $f_{850\mu\text{m}} < 2\text{mJy}$, *Monthly Notices Roy. Astr. Soc.* **384**, 1611-1626.

D. Krajnović, R. Bacon, M. Cappellari, R. L. Davies, **P. T. de Zeeuw**, E. Emsellem, J. Falcón-Barroso, H. Kuntschner, **R. M. McDermid**, R. F. Peletier, M. Sarzi, **R. C. E. van den Bosch**, and G. van de Ven, The SAURON project - XII. Kinematic substructures in early-type galaxies: evidence for discs in fast rotators, *Monthly Notices Roy. Astr. Soc.* **390**, 93-117.

M. Kriek, A. van der Wel, P. G. van Dokkum, **M. Franx**, and G. D. Illingworth, The Detection of a Red Sequence of Massive Field Galaxies at $z \sim 2.3$ and Its Evolution to $z \sim 0$, *Astrophys. J.* **682**, 896-906.

M. Kriek, P. G. van Dokkum, **M. Franx**, G. D. Illingworth, D. Marchesini, **R. Quadri**, G. Rudnick, **E. N. Taylor**, N. M. Förster Schreiber, E. Gawiser, I. Labbé, P. Lira, and S. Wuyts, A Near-Infrared Spectroscopic Survey of K-selected Galaxies at $z \sim 2.3$: Redshifts and Implications for Broadband Photometric Studies, *Astrophys. J.* **677**, 219-237.

J. M. D. Kruijssen, Explaining the mass-to-light ratios of globular clusters, *Astron. Astrophys.* **486**, L21-L24.

J. M. D. Kruijssen and H. J. G. L. M. Lamers, The photometric evolution of star clusters and the preferential loss of low-mass bodies - with an application to globular clusters, *Astron. Astrophys.* **490**, 151-171.

K. Kuijken, GaaP: PSF- and aperture-matched photometry using shapelets, *Astron. Astrophys.* **482**, 1053-1067.

K. Kuijken, X. Siemens, and T. Vachaspati, Microlensing by cosmic strings, *Monthly Notices Roy. Astr. Soc.* **384**, 161-164.

K. Lai, J.-S. Huang, G. Fazio, E. Gawiser, R. Ciardullo, **M. Damen**, **M. Franx**, C. Gronwall, I. Labbé, G. Magdis, and P. van Dokkum, Spitzer Constraints on the Stellar Populations of Ly α -Emitting Galaxies at $z = 3.1$, *Astrophys. J.* **674**, 70-74.

J. S. Lawrence, M. C. B. Ashley, J. W. V. Storey, **L. Jolissaint**, and T. Travouillon, Adaptive Optics Sky Coverage for Dome C Telescopes, *Publ. Astron. Soc. Pacific* **120**, 1119-1127.

V. Lebouteiller, J. Bernard-Salas, **B. Brandl**, D. G. Whelan, Y. Wu, V. Charmandaris, D. Devost, and J. R. Houck, Chemical Composition and Mixing in Giant H II Regions: NGC 3603, 30 Doradus, and N66, *Astrophys. J.* **680**, 398-419.

E. Lenc, **M. A. Garrett**, O. Wucknitz, J. M. Anderson, and S. J. Tingay, A Deep, High-Resolution Survey of the Low-Frequency Radio Sky, *Astrophys. J.* **673**, 78-95.

X. Liu, A. E. Shapley, A. L. Coil, **J. Brinchmann**, and C.-P. Ma, Metallicities and Physical Conditions in Star-forming Galaxies at $z \sim 1.0$ -1.5, *Astrophys. J.* **678**, 758-779.

D. Lommen, J. K. Jrgensen, **E. F. van Dishoeck**, and **A. Crapsi**, SMA observations of young disks: separating envelope, disk, and stellar masses in class I YSOs, *Astron. Astrophys.* **481**, 141-147.

W. Lyra, **A. Johansen**, H. Klahr, and N. Piskunov, Embryos grown in the dead zone. Assembling the first protoplanetary cores in low mass self-gravitating circumstellar disks of gas and solids, *Astron. Astrophys.* **491**, L41-L44.

C. Martin-Zaïdi, **E. F. van Dishoeck**, J.-C. Augereau, P.-O. Lagage, and E. Pantin, Searching for molecular hydrogen mid-infrared emission in the circumstellar environments of Herbig Be stars, *Astron. Astrophys.* **489**, 601-605.

F. Maschietto, **N. A. Hatch**, B. P. Venemans, **H. J. A. Röttgering**, **G. K. Miley**, R. A. Overzier, M. A. Dopita, P. R. Eisenhardt, J. D. Kurk, G. R. Meurer, L. Pentericci, P. Rosati, S. A. Stanford, W. van Breugel, and A. W. Zirm, [OIII] emitters in the field of the MRC0316-257 protocluster, *Monthly Notices Roy. Astr. Soc.* **389**, 1223-1232.

R. J. Mathar, Spherical Trigonometry of the Projected Baseline Angle, *Serbian Astronomical Journal* **177**, 115-124.

R. J. Mathar, KARHUNEN-LOÈVE Basis Functions of Kolmogorov Turbulence in the Sphere, *Baltic Astronomy* **17**, 383-398.

S. Mathur, G. R. Sivakoff, **R. J. Williams**, and F. Nicastro, On the nature of the $z=0$ X-ray absorbers: I. Clues from an external group, *A. Space Sci.* **315**, 93-98.

B. Matthews, E. Bergin, **A. Crapsi**, **M. Hogerheijde**, J. Jørgensen, D. Marrone, and R. Rao, The Class 0 source Barnard 1c. Most recent results, *A. Space Sci.* **313**, 65-68.

B. Merín, J. Jørgensen, L. Spezzi, J. M. Alcalá, N. J. Evans, II, P. M. Harvey, T. Prusti, N. Chapman, T. Huard, **E. F. van Dishoeck**, and F. Comerón, The Spitzer c2d Survey of Large, Nearby, Interstellar Clouds. XI. Lupus Observed with IRAC and MIPS, *Astrophys. J. Suppl. Ser.* **177**, 551-583.

F. M. Montenegro-Montes, K.-H. Mack, M. Vigotti, C. R. Benn, R. Carballo, J. I. González-Serrano, **J. Holt**, and F. Jiménez-Luján, Radio spectra and polarization properties of radio-loud broad absorption-line quasars, *Monthly Notices Roy. Astr. Soc.* **388**, 1853-1868.

E. Noordermeer, M. R. Merrifield, L. Coccatto, M. Arnaboldi, M. Capaccioli, N. G. Douglas, K. C. Freeman, O. Gerhard, **K. Kuijken**, F. de Lorenzi, N. R. Napolitano, and A. J. Romanowsky, Testing the nature of S0 galaxies using planetary nebula kinematics in NGC 1023, *Monthly Notices Roy. Astr. Soc.* **384**, 943-952.

K. I. Öberg, A. C. A. Boogert, K. M. Pontoppidan, G. A. Blake, N. J. Evans, **F. Lahuis**, and **E. F. van Dishoeck**, The c2d Spitzer Spectroscopic Survey of Ices around Low-Mass Young Stellar Objects. III. CH₄, *Astrophys. J.* **678**, 1032-1041.

T. Oosterbroek, I. Cognard, A. Golden, P. Verhooe, D. D. E. Martin, C. Erd, R. Schulz; **J. A. Stuwe**, A. Stankov, T. M. Ho, Simultaneous Absolute Timing of the Crab Pulsar at Radio and Optical Wavelength, *Astron. Astrophys.* **488**, 271-277

R. A. Overzier, R. J. Bouwens, N. J. G. Cross, B. P. Venemans, **G. K. Miley**, A. W. Zirm, N. Benítez, J. P. Blakeslee, D. Coe, R. Demarco, H. C. Ford, N. L. Homeier, G. D. Illingworth, J. D. Kurk, A. R. Martel, S. Mei, **I. Oliveira**, **H. J.**

A. Röttgering, Z. I. Tsvetanov, and W. Zheng, Lyman Break Galaxies, Ly α Emitters, and a Radio Galaxy in a Protocluster at $z = 4.1$, *Astrophys. J.* **673**, 143-162.

D. L. Padgett, L. M. Rebull, K. R. Stapelfeldt, N. L. Chapman, S.-P. Lai, L. G. Mundy, N. J. Evans, II, T. Y. Brooke, L. A. Cieza, W. J. Spiesman, A. Noriega-Crespo, C.-E. McCabe, L. E. Allen, G. A. Blake, P. M. Harvey, T. L. Huard, J. K. Jørgensen, D. W. Koerner, P. C. Myers, A. I. Sargent, P. Teuben, **E. F. van Dishoeck**, Z. Wahhaj, and K. E. Young, The Spitzer c2d Survey of Large, Nearby, Interstellar Clouds. VII. Ophiuchus Observed with MIPS, *Astrophys. J.* **672**, 1013-1037.

O. Panić, **M. R. Hogerheijde**, D. Wilner, and C. Qi, Gas and dust mass in the disc around the Herbig Ae star HD 169142, *Astron. Astrophys.* **491**, 219-227.

A. H. Pawlik and **J. Schaye**, TRAPHIC - radiative transfer for smoothed particle hydrodynamics simulations, *Monthly Notices Roy. Astr. Soc.* **389**, 651-677.

C. Pinte, D. L. Padgett, F. Ménard, K. R. Stapelfeldt, G. Schneider, J. Olofsson, **O. Panić**, J. C. Augereau, G. Duchêne, J. Krist, K. Pontoppidan, M. D. Perrin, C. A. Grady, J. Kessler-Silacci, **E. F. van Dishoeck**, **D. Lommen**, M. Silverstone, D. C. Hines, S. Wolf, G. A. Blake, T. Henning, and B. Stecklum, Probing dust grain evolution in IM Lupi's circumstellar disc. Multi-wavelength observations and modelling of the dust disc, *Astron. Astrophys.* **489**, 633-650.

K. M. Pontoppidan, G. A. Blake, **E. F. van Dishoeck**, A. Smette, M. J. Ireland, and J. Brown, Spectroastrometric Imaging of Molecular Gas within Protoplanetary Disk Gaps, *Astrophys. J.* **684**, 1323-1329.

K. M. Pontoppidan, A. C. A. Boogert, H. J. Fraser, **E. F. van Dishoeck**, G. A. Blake, **F. Lahuis**, **K. I. Öberg**, N. J. Evans, II, and C. Salyk, The c2d Spitzer Spectroscopic Survey of Ices around Low-Mass Young Stellar Objects. II. CO₂, *Astrophys. J.* **678**, 1005-1031.

A. Pontzen, F. Governato, M. Pettini, **C. M. Booth**, G. Stinson, J. Wadsley, A. Brooks, T. Quinn, and M. Haehnelt, Damped Lyman α systems in galaxy formation simulations, *Monthly Notices Roy. Astr. Soc.* **390**, 1349-1371.

C. Qi, D. J. Wilner, Y. Aikawa, G. A. Blake, and **M. R. Hogerheijde**, Resolving the Chemistry in the Disk of TW Hydrae. I. Deuterated Species, *Astrophys. J.* **681**, 1396-1407.

R. F. Quadri, **R. J. Williams**, K.-S. Lee, **M. Franx**, P. van Dokkum, and G. B. Brammer, A Confirmation of the Strong Clustering of Distant Red Galaxies at $2 < z < 3$, *Astrophys. J. Lett.* **685**, L1-L4.

D. Raban, B. Heijligers, **H. Röttgering**, K. Meisenheimer, **W. Jaffe**, H. U. Käufl, and T. Henning, The core flux of the brightest 10 μm galaxies in the southern sky, *Astron. Astrophys.* **484**, 341-345.

J. L. Racusin, S. V. Karpov, M. Sokolowski, J. Granot, X. F. Wu, V. Pal'Shin, S. Covino, A. J. van der Horst, S. R. Oates, P. Schady, R. J. Smith, J. Cummings, R. L. C. Starling, L. W. Piotrowski, B. Zhang, P. A. Evans, S. T. Holland, K. Malek, M. T. Page, L. Vetere, R. Margutti, C. Guidorzi, A. P. Kamble, P. A. Curran, A. Beardmore, C. Kouveliotou, L. Mankiewicz, A. Melandri, P. T. O'Brien, K. L. Page, T. Piran, N. R. Tanvir, G. Wrochna, R. L. Aptekar, S. Barthelmy, C. Bartolini, G. M. Beskin, S. Bondar, M. Bremer, S. Campana, A. Castro-Tirado, A. Cucchiara, M. Cwiok, P. D'Avanzo, V. D'Elia, M. D. Valle, A. de Ugarte Postigo, W. Dominik, A. Falcone, F. Fiore, D. B. Fox, D. D. Frederiks, A. S. Fruchter, D. Fugazza, **M. A. Garrett**, N. Gehrels, S. Golenetskii, A. Gomboc, J. Gorosabel, G. Greco, A. Guarnieri, S. Immler, M. Jelinek, G. Kasproicz, V. La Parola, A. J. Levan, V. Mangano, E. P. Mazets, E. Molinari, A. Moretti, K. Nawrocki, P. P. Oleynik, J. P. Osborne, C. Pagani, S. B. Pandey, Z. Paragi, M. Perri, A. Piccioni, E. Ramirez-Ruiz, P. W. A. Roming, I. A. Steele, R. G. Strom, V. Testa, G. Tosti, M. V. Ulanov, K. Wiersema, R. A. M. J. Wijers, J. M. Winters, A. F. Zarnecki, F. Zerbi, P. Mészáros, G. Chincarini, and D. N. Burrows, Broadband observations of the naked-eye γ -ray burst GRB080319B, *Nature* **455**, 183-188.

M. Rauch, M. Haehnelt, A. Bunker, G. Becker, F. Marleau, J. Graham, S. Cristiani, M. Jarvis, C. Lacey, S. Morris, C. Peroux, **H. Röttgering**, and T. Theuns, A Population of Faint Extended Line Emitters and the Host Galaxies of Optically Thick QSO Absorption Systems, *Astrophys. J.* **681**, 856-880.

E. E. Rigby, P. N. Best, and **I. A. G. Snellen**, A sample of mJy radio sources at 1.4 GHz in the Lynx and Hercules fields - II. Cosmic evolution of the space density of FR I radio sources, *Monthly Notices Roy. Astr. Soc.* **385**, 310-334.

J. R. Rigby, D. Marcillac, E. Egami, G. H. Rieke, J. Richard, J.-P. Kneib, D. Fadda, C. N. A. Willmer, C. Borys, **P. P. van der Werf**, P. G. Pérez-González,

K. K. Knudsen, and C. Papovich, Mid-Infrared Spectroscopy of Lensed Galaxies at $1 < z < 3$: The Nature of Sources Near the MIPS Confusion Limit, *Astrophys. J.* **675**, 262-280.

P. Salomé, F. Combes, Y. Revaz, A. C. Edge, **N. A. Hatch**, A. C. Fabian, and R. M. Johnstone, Cold gas in the Perseus cluster core: excitation of molecular gas in filaments, *Astron. Astrophys.* **484**, 317-325.

D. M. Salter, **M. R. Hogerheijde**, and G. A. Blake, Captured at millimeter wavelengths: a flare from the classical T Tauri star DQ Tauri, *Astron. Astrophys.* **492**, L21-L24.

C. Salyk, K. M. Pontoppidan, G. A. Blake, **F. Lahuis**, **E. F. van Dishoeck**, and N. J. Evans, II, H₂O and OH Gas in the Terrestrial Planet-forming Zones of Protoplanetary Disks, *Astrophys. J. Lett.* **676**, L49-L52.

J. Schaye and **C. Dalla Vecchia**, On the relation between the Schmidt and Kennicutt-Schmidt star formation laws and its implications for numerical simulations, *Monthly Notices Roy. Astr. Soc.* **383**, 1210-1222.

R. S. Schnerr, H. F. Henrichs, C. Neiner, E. Verdugo, J. de Jong, **V. C. Geers**, K. Wiersema, B. van Dalen, A. Tijani, B. Plaggenborg, and K. L. J. Rygl, Magnetic field measurements and wind-line variability of OB-type stars, *Astron. Astrophys.* **483**, 857-867.

R. Schulz, E. Jehin, J. Manfroid, D. Hutsemékers, C. Arpigny, A. Cochran, J. M. Zucconi, **J. A. Stuwe**, Isotopic abundance in the CN coma of comets: Ten years of measurements, *Planetary and Space Science* **45**, 1713-1718

M. Schweitzer, **B. Groves**, H. Netzer, D. Lutz, E. Sturm, A. Contursi, R. Genzel, L. J. Tacconi, S. Veilleux, D.-C. Kim, D. Rupke, and A. J. Baker, Extended Silicate Dust Emission in Palomar-Green QSOs, *Astrophys. J.* **679**, 101-117.

I. A. G. Snellen, **S. Albrecht**, **E. J. W. de Mooij**, and **R. S. Le Poole**, Ground-based detection of sodium in the transmission spectrum of exoplanet HD 209458b, *Astron. Astrophys.* **487**, 357-362.

L. Spezzi, J. M. Alcalá, E. Covino, A. Frasca, D. Gandolfi, **I. Oliveira**, N. Chapman, N. J. Evans, II, T. L. Huard, J. K. Jørgensen, **B. Merín**, and K. R. Stapelfeldt, The Young Population of the Chamaeleon II Dark Cloud, *Astrophys. J.* **680**, 1295-1318.

C. Sterken, **A. M. van Genderen**, A. Plummer, and A. F. Jones, Wra 751, a luminous blue variable developing an S Doradus cycle, *Astron. Astrophys.* **484**, 463-467.

C. Tasse, P. N. Best, **H. Röttgering**, and D. Le Borgne, Radio-loud AGN in the XMM-LSS field. II. A dichotomy in environment and accretion mode?, *Astron. Astrophys.* **490**, 893-904.

C. Tasse, D. Le Borgne, **H. Röttgering**, P. N. Best, M. Pierre, and B. Rocca-Volmerange, Radio-loud AGN in the XMM-LSS field. I. Optical identification and sample selection, *Astron. Astrophys.* **490**, 879-891.

G. van de Ven, **P. T. de Zeeuw**, and **R. C. E. van den Bosch**, Recovery of the internal orbital structure of galaxies, *Monthly Notices Roy. Astr. Soc.* **385**, 614-646.

A. van der Wel, B. P. Holden, A. W. Zirm, **M. Franx**, A. Rettura, G. D. Illingworth, and H. C. Ford, Recent Structural Evolution of Early-Type Galaxies: Size Growth from $z = 1$ to $z = 0$, *Astrophys. J.* **688**, 48-58.

P. G. van Dokkum, **M. Franx**, **M. Kriek**, B. Holden, G. D. Illingworth, D. Magee, R. Bouwens, D. Marchesini, **R. Quadri**, G. Rudnick, **E. N. Taylor**, and S. Toft, Confirmation of the Remarkable Compactness of Massive Quiescent Galaxies at $z \sim 2.3$: Early-Type Galaxies Did not Form in a Simple Monolithic Collapse, *Astrophys. J. Lett.* **677**, L5-L8.

M. C. van Hemert and **E. F. van Dishoeck**, Photodissociation of small carbonaceous molecules of astrophysical interest, *Chemical Physics* **343**, 292-302.

R. C. E. van den Bosch, G. van de Ven, E. K. Verolme, **M. Cappellari**, and **P. T. de Zeeuw**, Triaxial orbit based galaxy models with an application to the (apparent) decoupled core galaxy NGC 4365., *Monthly Notices Roy. Astr. Soc.* **385**, 647-666.

E. F. van Dishoeck and J. K. Jørgensen, Star and planet-formation with ALMA: an overview, *A. Space Sci.* **313**, 15-22.

M. C. van Hemert and **E. F. van Dishoeck**, Photodissociation of small carbonaceous molecules of astrophysical interest, *Chemical Physics*, **343**, 292-302.

M. van Hoven and **Y. Levin**, Hydromagnetic waves in a superfluid neutron star with strong vortex pinning, *Monthly Notices Roy. Astr. Soc.* **391**, 283-289.

T. A. van Kempen, S. D. Doty, **E. F. van Dishoeck**, **M. R. Hogerheijde**, and J. K. Jørgensen, Modeling water emission from low-mass protostellar envelopes, *Astron. Astrophys.* **487**, 975-991.

L. van Starckenburg, **P. P. van der Werf**, **M. Franx**, I. Labbé, G. Rudnick, and S. Wuyts, Dynamical properties of a large young disk galaxy at $z = 2.03$, *Astron. Astrophys.* **488**, 99-112.

C. Vlahakis, M. Baes, G. Bendo, and A. Lundgren, LABOCA and MAMBO-2 imaging of the dust ring of the Sombrero galaxy (NGC 4594), *Astron. Astrophys.* **485**, L25-L28.

W. H. T. Vlemmings and **H. J. van Langevelde**, The magnetic field of the proto-planetary nebula candidate IRAS 19296+2227, *Astron. Astrophys.* **488**, 619-622.

C. J. Walcher, F. Lamareille, D. Vergani, S. Arnouts, V. Buat, S. Charlot, L. Tresse, O. Le Fèvre, M. Bolzonella, **J. Brinchmann**, L. Pozzetti, G. Zamorani, D. Bottini, B. Garilli, V. Le Brun, D. Maccagni, B. Milliard, R. Scaramella, M. Scodeggio, G. Vettolani, A. Zanichelli, C. Adami, S. Bardelli, A. Cappi, P. Ciliegi, T. Contini, P. Franzetti, S. Foucaud, I. Gavignaud, L. Guzzo, O. Ilbert, A. Iovino, H. J. McCracken, B. Marano, C. Marinoni, A. Mazure, B. Meneux, R. Merighi, S. Paltani, R. Pellò, A. Pollo, M. Radovich, E. Zucca, C. Lonsdale, and C. Martin, The VVDS-SWIRE-GALEX-CFHTLS surveys: physical properties of galaxies at z below 1.2 from photometric data, *Astron. Astrophys.* **491**, 713-730.

A.-M. Weijmans, D. Krajnović, G. van de Ven, T. A. Oosterloo, R. Morganti, and **P. T. de Zeeuw**, The shape of the dark matter halo in the early-type galaxy NGC 2974, *Monthly Notices Roy. Astr. Soc.* **383**, 1343-1358.

N. Werner, F. Durret, T. Ohashi, S. Schindler, and **R. P. C. Wiersma**, Observations of Metals in the Intra-Cluster Medium, *Space Science Reviews* **134**, 337-362.

C. Wolf, **H. Hildebrandt**, **E. N. Taylor**, and K. Meisenheimer, Calibration update of the COMBO-17 CDFS catalogue, *Astron. Astrophys.* **492**, 933-936.

Y. Wu, J. Bernard-Salas, V. Charmandaris, V. Leboutteiller, L. Hao, **B. R. Brandl**, and J. R. Houck, Elemental Abundances of Blue Compact Dwarfs from Mid-Infrared Spectroscopy with Spitzer, *Astrophys. J.* **673**, 193-202.

Y. Wu, V. Charmandaris, J. R. Houck, J. Bernard-Salas, V. Leboutteiller, **B. R. Brandl**, and D. Farrah, Blue Compact Dwarf Galaxies with Spitzer: The Infrared/Radio Properties, *Astrophys. J.* **676**, 970-977.

S. Wuyts, I. Labbé, N. M. F. Schreiber, **M. Franx**, G. Rudnick, G. B. Brammer, and P. G. van Dokkum, FIREWORKS U₃₈-to-24 μ m Photometry of the GOODS Chandra Deep Field-South: Multiwavelength Catalog and Total Infrared Properties of Distant K_s-selected Galaxies, *Astrophys. J.* **682**, 985-1003.

A. W. Zirm, S. A. Stanford, M. Postman, R. A. Overzier, J. P. Blakeslee, P. Rosati, J. Kurk, L. Pentericci, B. Venemans, **G. K. Miley**, **H. J. A. Röttgering**, **M. Franx**, A. van der Wel, R. Demarco, and W. van Breugel, The Nascent Red Sequence at $z \sim 2$, *Astrophys. J.* **680**, 224-231.

T. Zwitter, A. Siebert, U. Munari, K. C. Freeman, A. Siviero, F. G. Watson, J. P. Fulbright, R. F. G. Wyse, R. Campbell, G. M. Seabroke, M. Williams, M. Steinmetz, O. Bienaymé, G. Gilmore, E. K. Grebel, A. Helmi, J. F. Navarro, B. Anguiano, C. Boeche, D. Burton, P. Cass, J. Dawe, K. Fiegert, M. Hartley, K. Russell, L. Veltz, J. Bailin, J. Binney, J. Bland-Hawthorn, A. Brown, W. Dehnen, N. W. Evans, P. Re Fiorentin, M. Fiorucci, O. Gerhard, B. Gibson, A. Kelz, K. Kuijken, G. Matijević, I. Minchev, Q. A. Parker, J. Peñarrubia, A. Quillen, M. A. Read, W. Reid, S. Roeser, G. Ruchti, R.-D. Scholz, M. C. Smith, R. Sordo, E. Tolstoi, L. Tomasella, S. Vidrih, and E. Wylie-de Boer, The Radial Velocity Experiment (rave): Second Data Release, *Astron. J.* **136**, 421-451

X.3. Conference Papers, Review Articles, etc.

P. N. Appleton, A. Gil de Paz, B. Madore, W. Reach, C. Struck, **B. Brandl**, T. Jarrett, D. Fadda, V. Charmandaris, L. Armus, B. Smith, J. Mazarella, S. Lord, S. Laine, and K. Borne, Massive Star Formation and Dust in Collisional Ring Galaxies: From GALEX to Spitzer, Infrared Diagnostics of Galaxy Evolution

(R.-R. Chary, H. I. Teplitz, and K. Sheth, eds.), *Astronomical Society of the Pacific Conference Series*, vol. 381, March 2008, pp. 128-131.

R. Arsenault, P.-Y. Madec, N. Hubin, J. Paufigue, S. Stroebele, C. Soenke, R. Donaldson, E. Fedrigo, S. Oberti, S. Tordo, M. Downing, M. Kiekebusch, R. Conzelmann, M. Duchateau, A. Jost, W. Hackenberg, D. Bonaccini Calia, B. Delabre, **R. Stuik**, R. Biasi, D. Gallieni, P. Lazzarini, M. Lelouarn, and A. Glindeman, *ESO adaptive optics facility, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, vol. 7015, July 2008, pp. 701524-701524-12.

J. E. Beckman, K. Fathi, N. Piñol, **S. Toonen**, O. Hernandez, and C. Carignan, *The Tremaine-Weinberg Method for Pattern Speeds Using H α Emission from Ionized Gas, Astronomical Society of the Pacific Conference Series (J. G. Funes and E. M. Corsini, eds.), Astronomical Society of the Pacific Conference Series*, vol. 396, October 2008, pp. 353-354.

S. Bottinelli, K. H. Young, R. Chamberlin, R. P. J. Tilanus, M. A. Gurwell, D. J. Wilner, H. Shinnaga, H. Yoshida, P. Friberg, **H. J. van Langevelde**, **E. F. van Dishoeck**, **M. R. Hogerheijde**, A. M. Hughes, R. D. Christensen, R. E. Hills, J. S. Richer, and E. Curtis, *The eSMA: description and first results, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, vol. 7012, August 2008, pp. 70120D-70120D-12.

B. R. Brandl, R. Lenzen, E. Pantin, A. Glasse, J. Blommaert, L. Venema, **F. Molster**, R. Siebenmorgen, H. Boehnhardt, **E. van Dishoeck**, **P. van der Werf**, T. Henning, W. Brandner, P.-O. Lagage, T. J. T. Moore, M. Baes, C. Waelkens, C. Wright, H. U. Käufel, **S. Kendrew**, **R. Stuik**, and **L. Jolissaint**, *METIS: the mid-infrared E-ELT imager and spectrograph, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, vol. 7014, August 2008, pp. 70141N-70141N-15.

A. G. A. Brown, *Learning about Galactic structure with Gaia astrometry, American Institute of Physics Conference Series*, vol. 1082, December 2008, pp. 209-215.

M. Bureau, R. Bacon, **M. Cappellari**, F. Combes, R. L. Davies, **P. T. de Zeeuw**, E. Emsellem, J. Falcòn-Barroso, H. Jeong, D. Krajnović, H. Kuntschner, **R. M. McDermid**, R. F. Peletier, M. Sarzi, K. L. Shapiro, G. van de Ven, S. K. Yi, and L. M. Young, *Star Formation in Nearby Early-Type Galaxies: Mapping in UV, Optical, and CO, Mapping the Galaxy and Nearby Galaxies (K. Wada and F. Combes, eds.), ISBN 978-0-387-72767-7, 2008, pp. 312.*

M. L. Conciatore, F. Nicastro, M. Elvis, S. Mathur, and **R. J. Williams**, Insights into the Origin of Low -and High- velocity OVI Absorbers from AGN Host Galaxies, AAS/High Energy Astrophysics Division, vol. 10, 26.14, March 2008.

W. Cotton, J. Monnier, F. Baron, K.-H. Hofmann, S. Kraus, G. Weigelt, **S. Rengaswamy**, E. Thiébaud, P. Lawson, **W. Jaffe**, C. Hummel, T. Pauls, H. Schmitt, P. Tuthill, and J. Young, 2008 imaging beauty contest, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 7013, July 2008, pp. 70131N-70131N-14.

J. Cuadra, P. J. Armitage, and **R. D. Alexander**, Stellar Dynamical Evidence against a Cold Disk Origin for Stars in the Galactic Center, AAS/Division of Dynamical Astronomy Meeting, vol. 39, 01.02, May 2008.

H. M. Cuppen, **G. W. Fuchs**, **S. Ioppolo**, **S. E. Bisschop**, **K. I. Öberg**, **E. F. van Dishoeck**, and **H. Linnartz**, Formation of alcohols on ice surfaces, Organic Matter in Space, Proceedings of the International Astronomical Union, IAU Symposium, vol. 251, pp. 377-382.

D. Devost, S. Guiles, D. G. Whelan, **B. R. Brandl**, C. Leitherer, Y. Wu, L. Hao, and J. R. Houck, High Ionization in Starburst Galaxies, The Second Annual Spitzer Science Center Conference: Infrared Diagnostics of Galaxy Evolution (R.-R. Chary, H. I. Teplitz, and K. Sheth, eds.), Astronomical Society of the Pacific Conference Series, vol. 381, March 2008, pp. 279-284.

T. de Zeeuw, The Perfect Machine, The Messenger **132**, pp. 2-4.

J. Falcón-Barroso, R. Bacon, M. Cappellari, R. L. Davies, **P. T. de Zeeuw**, E. Emsellem, D. Krajnovic, H. Kuntschner, **R. M. McDermid**, R. F. Peletier, M. Sarzi, and G. van de Ven, Towards a New Classification of Early-type Galaxies: An Integral-field View, Pathways Through an Eclectic Universe (J. H. Knapen, T. J. Mahoney, and A. Vazdekis, eds.), Astronomical Society of the Pacific Conference Series, vol. 390, June 2008, pp. 227-231.

B. Groves and L. Kewley, Distinguishing Active Galactic Nuclei and Star Formation, Pathways Through an Eclectic Universe (J. H. Knapen, T. J. Mahoney, and A. Vazdekis, eds.), Astronomical Society of the Pacific Conference Series, vol. 390, June 2008, pp. 283-287.

M. G. Haehnelt, M. Rauch, A. Bunker, G. Becker, F. Marleau, J. Graham, S. Cristiani, M. J. Jarvis, C. Lacey, S. Morris, C. Peroux, **H. Röttgering**, and T.

Theuns, Hunting for the Building Blocks of Galaxies like our own Milky Way with FORS, *The Messenger* **132**, 41-45.

K.-H. Hofmann, M. Heininger, **W. Jaffe**, S. Kraus, B. Lopez, F. Millour, D. Schertl, G. Weigelt, and S. Wolf, Aperture-synthesis imaging with the mid-infrared instrument MATISSE, *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, vol. 7013, July 2008, pp. 70133Y-70133Y-7.

L. Jolissaint, H. Carfantan, and E. Anterrieu, Exploring the impact of PSF reconstruction errors on the reduction of astronomical adaptive optics based data, *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, vol. 7015, July 2008, pp. 70152K-70152K-12.

J. Jorgensen, **D. Lommen**, T. L. Bourke, **E. F. van Dishoeck**, D. Wilner, and PROSAC team, The Evolution of Matter in the Embedded Stages of Low-Mass Protostars, *American Astronomical Society Meeting Abstracts*, vol. 211, 162.09, March 2008.

I. Kamp, J. R. Martínez-Galarza, E. Paunzen, K. Y. L. Su, A. Gáspár, and G. H. Rieke, λ Bootis stars: Current status and new insights from Spitzer, *Contributions of the Astronomical Observatory Skalnaté Pleso* **38**, 147-156.

A. Kelz, M. Roth, S. Bauer, J. Gerssen, T. Hahn, P. Weilbacher, U. Laux, M. Loupiau, J. Kosmowski, **R. McDermid**, and R. Bacon, Calibration issues for MUSE, *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, vol. 7014, August 2008, pp. 701458-701458-12.

S. Kendrew, **L. Jolissaint**, **R. J. Mathar**, **R. Stuik**, S. Hippler, and **B. Brandl**, Atmospheric refractivity effects on mid-infrared ELT adaptive optics, *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, vol. 7015, July 2008, pp. 70155T-70155T-11.

S. Lagarde, B. Lopez, R. G. Petrov, K. H. Hofmann, S. Kraus, **W. Jaffe**, P. Antonelli, Y. Bresson, C. Leinert, and A. Matter, MATISSE: concept analysis, *Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series*, vol. 7013, July 2008, pp. 701332-701332-9.

R. Launhardt, E. J. Bakker, P. Ballester, H. Baumeister, P. Bizenberger, H. Bleuler, R. Dändliker, F. Delplancke, F. Derie, M. Fleury, A. Glindemann, D. Gillet, H. Hanenburg, T. Henning, **W. Jaffe**, J. A. de Jong, R. Köhler, C. Maire, **R. J. Mathar**, D. Mégevand, Y. Michellod, P. Müllhaupt, K. Murakawa, F. Pepe, **R. S. Le Poole**, J. Pragt, D. Queloz, A. Quirrenbach, S. Reffert, L. Säche,

Y. Salvadé, O. Scherler, D. Ségransan, J. Setiawan, D. Sosnowska, R. N. Tubbs, L. Venema, K. Wagner, L. Weber, and R. Wüthrich, The PRIMA Astrometric Planet Search Project, The Power of Optical/IR Interferometry: Recent Scientific Results and 2nd Generation, ESO Astrophysics Symposia, (A. Richichi, F. Delplancke, F. Paresce, and A. Chelli, eds.), ISBN 978-3-540-74253-1, 2008, pp. 551-553.

S. Levin, Humanising Astronomy, Communicating Astronomy with the Public 2007: Proceedings from the IAU/National Observatory of Athens/ESA/ESO Conference, (L. L. Christensen, M. Zoulias, and I. Robson, eds.), June 2008, pp. 172-176.

B. Lopez, P. Antonelli, S. Wolf, S. Lagarde, **W. Jaffe**, R. Navarro, U. Graser, R. Petrov, G. Weigelt, Y. Bresson, K. H. Hofmann, U. Beckman, T. Henning, W. Laun, C. Leinert, S. Kraus, S. Robbe-Dubois, F. Vakili, A. Richichi, P. Abraham, J.-C. Augereau, J. Behrend, P. Berio, N. Berruyer, O. Chesneau, J. M. Clause, C. Connot, K. Demyk, W. C. Danchi, M. Dugué, G. Finger, S. Flament, A. Glazenberg, H. Hannenburg, M. Heininger, Y. Hugues, J. Hron, S. Jankov, F. Kerschbaum, G. Kroes, H. Linz, J.-L. Lizon, P. Mathias, **R. Mathar**, A. Matter, J. L. Menut, K. Meisenheimer, F. Millour, N. Nardetto, U. Neumann, E. Nussbaum, A. Niedzielski, L. Mosoni, J. Olofsson, Y. Rabbia, T. Ratzka, F. Rigal, A. Roussel, D. Schertl, F.-X. Schmider, B. Stecklum, E. Thiebaut, M. Vannier, B. Valat, K. Wagner, and L. B. F. M. Waters, MATISSE: perspective of imaging in the mid-infrared at the VLTI, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 7013, July 2008, pp. 70132B-70132B-10.

A. Matter, **W. Jaffe**, M. Vannier, S. Morel, S. Lagarde, B. Lopez, F. Rantakyro, T. Rivinius, R. G. Petrov, and C. Leinert, First step to detect an extrasolar planet using simultaneous observations with the two VLTI instruments AMBER and MIDI, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 7013, July 2008, pp. 701341-701341-10.

K. Meisenheimer, **D. Raban**, K. Tristram, M. Schartmann, **W. Jaffe**, **H. Röttgering**, and L. Burtscher, Mid-infrared Interferometry of Active Galactic Nuclei: an Outstanding Scientific Success of the VLTI, The Messenger 133, 36-41.

R. Morganti, E. Manthey, A. Crocker, T. Oosterloo, **P. T. de Zeeuw**, R. M. McDermid, D. Krajnovic, M. Cappellari, **A. Weijmans**, and M. Sarzi, The continuing formation of early-type galaxies: an H I survey, The Evolution of Galaxies Through the Neutral Hydrogen Window (R. Minchin and E.

Momjian, eds.), American Institute of Physics Conference Series, vol. 1035, August 2008, pp. 129-131.

K. I. Öberg, **E. F. van Dishoeck** and **H. Linnartz**, Photodesorption of ices - Releasing organic precursors into the gas phase, *Organic Matter in Space, Proceedings of the International Astronomical Union, IAU Symposium*, vol. 251, pp. 449-450

R. F. Peletier, K. Ganda, J. Falcón-Barroso, R. Bacon, M. Cappellari, R. L. Davies, **P. T. de Zeeuw**, E. Emsellem, D. Krajnovic, H. Kuntschner, **R. M. McDermid**, M. Sarzi, and G. van de Ven, Galactic Bulges and Inner Disks, as Seen by SAURON, *Astronomical Society of the Pacific Conference Series* (J. G. Funes and E. M. Corsini, eds.), vol. 396, October 2008, pp. 81-82.

A. Quirrenbach and **S. Albrecht**, Interferometric Spectroscopy, Precision Spectroscopy in Astrophysics (N. C. Santos, L. Pasquini, A. C. M. Correia, and M. Romaniello, eds.), *Proceedings of the ESO/Lisbon/Aveiro Conference held in Aveiro, 2008*, pp. 235-238.

A. Quirrenbach, **S. Albrecht**, **R. Vink**, O. V. D. Lühe, J. Hron, and G. Wiedemann, UVES-I: Interferometric High-Resolution Spectroscopy, The Power of Optical/IR Interferometry: Recent Scientific Results and 2nd Generation, *ESO Astrophysics Symposia* (A. Richichi, F. Delplancke, F. Paresce, and A. Chelli, eds.), ISBN 978-3-540-74253-1, 2008, pp. 383-394.

D. Sand, M. L. Graham, C. Bildfell, D. W. Just, S. Herbert-Fort, S. Sivanandam, C. J. Pritchett, **H. Hoekstra**, and D. Zaritsky, Supernova 2008ih, *Central Bureau Electronic Telegrams* 1621.

D. Sand, M. L. Graham, S. Herbert-Fort, D. Just, C. Bildfell, C. J. Pritchett, **H. Hoekstra**, S. Sivanandam, and D. Zaritsky, Supernovae 2008hb-2008hf, *Central Bureau Electronic Telegrams* 1570.

M. Sarzi, R. Bacon, M. Cappellari, R. L. Davies, **P. T. de Zeeuw**, E. Emsellem, J. Falcón-Barroso, D. Krajnovic, H. Kuntschner, **R. M. McDermid**, R. F. Peletier, and G. van de Ven, Recent Star Formation in Nearby Early-type Galaxies, Pathways Through an Eclectic Universe (J. H. Knapen, T. J. Mahoney, and A. Vazdekis, eds.), *Astronomical Society of the Pacific Conference Series*, vol. 390, June 2008, pp. 218-226.

R. T. Schilizzi, P. E. F. Dewdney, and T. J. W. Lazio, The Square Kilometre Array, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 7012, August 2008, pp. 70121I-70121I-13.

N. Seymour, D. Stern, C. De Breuck, J. Vernet, R. Fosbury, A. Rettura, A. Zirm, B. Rocca-Volmerange, M. Lacy, H. Teplitz, A. Dey, M. Dickinson, W. van Breugel, **G. Miley**, **H. Röttgering**, P. Eisenhardt, P. McCarthy, F. De Breuck, and L. Vernet, Spitzer Observations of High Redshift Radio Galaxies, Infrared Diagnostics of Galaxy Evolution (R.-R. Chary, H. I. Teplitz, and K. Sheth, eds.), Astronomical Society of the Pacific Conference Series, vol. 381, March 2008, pp. 398-404.

R. Stuik, R. Arsenault, R. Conzelmann, **A. Deep**, B. Delabre, **P. Hallibert**, **L. Jolissaint**, N. Hubin, **S. Kendrew**, P.-Y. Madec, **F. Molster**, J. Paufigue, E. Pauwels, S. Stroebele, and E. Wieggers, ASSIST: the test setup for the VLT AO facility, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, vol. 7015, July 2008, pp. 70154F-70154F-9.

S. Toonen, K. Fathi, **J. Falcòn-Barroso**, J. E. Beckman, and P. T. de Zeeuw, The Pattern Speeds of NGC 6946, Pathways Through an Eclectic Universe (J. H. Knapen, T. J. Mahoney, and A. Vazdekis, eds.), Astronomical Society of the Pacific Conference Series, vol. 390, June 2008, pp. 322-323.

A. Trejo, E. Giacani, Z. Paragi, **H. J. van Langevelde**, G. Dubner, and A. M. Bykov, VLBI observations of the radio counterpart of IGR J20187+4041/2MASX J20183871+4041003 in the error box of the gamma-ray source AGL2021+4029/3EG J2020+4017, The Astronomer's Telegram 1597.

G. Tremblay, W. B. Sparks, M. Chiaberge, S. A. Baum, M. G. Allen, D. J. Axon, A. Capetti, D. J. E. Floyd, F. D. Macchetto, **G. K. Miley**, C. P. O'Dea, E. S. Perlman, and A. C. Quillen, HST/ACS Emission Line Snapshots of nearby 3CR Radio Galaxies, American Astronomical Society Meeting Abstracts, vol. 211, 157.03, March 2008.

V. Tudose, Z. Paragi, R. Fender, R. Spencer, **M. Garrett**, and A. Rushton, e-VLBI observations of Cyg X-3, The Astronomer's Telegram 1476.

V. Tudose, Z. Paragi, S. Trushkin, P. Soleri, R. Fender, **M. Garrett**, R. Spencer, A. Rushton, P. Burgess, M. Kunert-Bajraszewska, E. Pazderski, K. Borkowski, R. Hammargren, M. Lindqvist, and G. Maccaferri, e-VLBI observations of SS 433 in outburst, The Astronomer's Telegram 1836.

T. van Kempen, E. F. van Dishoeck, M. R. Hogerheijde, J. K. Joergensen, R. Guesten, and P. Schilke, The Warm And Dense Gas In Embedded Low-mass Protostars, American Astronomical Society Meeting Abstracts, vol. 211, 162.20, March 2008.

I. van Houten-Groeneveld, E. Bowell, M. E. Brown, T. Gehrels, S. J. Bus, M. E. Schwamb, and D. Rabinowitz, Minor Planet Observations [675 Palomar Mountain], Minor Planet Circulars **6336**, 5.

P. Woitke and A. Quirrenbach, The Chaotic Winds of AGB Stars: Observation Meets Theory, The Power of Optical/IR Interferometry: Recent Scientific Results and 2nd Generation, ESO Astrophysics Symposia, (A. Richichi, F. Delplancke, F. Paresce, and A. Chelli, eds.), ISBN 978-3-540-74253-1, 2008, pp. 181-185.

X.4. Astronomical Catalogues

K. K. Knudsen, **P. P. van der Werf**, and J.-P. Kneib, Submm observations in gravitational lenses (Knudsen+, 2008), VizieR Online Data Catalog **738**.

J. M. D. Kruijssen and H. J. G. L. M. Lamers, Photometric evolution of star clusters models, VizieR Online Data Catalog **349**.

J. P. Madrid, M. Chiaberge, D. Floyd, W. B. Sparks, D. Macchetto, **G. K. Miley**, D. Axon, A. Capetti, C. P. O'Dea, S. Baum, E. Perlman, and A. Quillen, NICMOS observations of 3CR radio sources (Madrid+, 2006), VizieR Online Data Catalog **216**.

E. Noordermeer, M. R. Merrifield, L. Coccato, M. Arnaboldi, M. Capaccioli, N. G. Douglas, K. C. Freeman, O. Gerhard, **K. Kuijken**, F. de Lorenzi, N. R. Napolitano, and A. J. Romanowsky, Velocities of NGC 1023 planetary nebulae (Noordermeer+, 2008), VizieR Online Data Catalog **738**.

E. E. Rigby, **I. A. G. Snellen**, and P. N. Best, 1.4GHz radio sources in Lynx and Hercules fields (Rigby+, 2007), VizieR Online Data Catalog **738**.

T. Zwitter, A. Siebert, U. Munari, K. C. Freeman, A. Siviero, F. G. Watson, J. P. Fulbright, R. F. G. Wyse, R. Campbell, G. M. Seabroke, M. Williams, M. Steinmetz, O. Bienayme, G. Gilmore, E. K. Grebel, A. Helmi, J. F. Navarro, B. Anguiano, C. Boeche, D. Burton, P. Cass, J. Dawe, K. Fiegert, M. Hartley, K. Russell, L. Veltz, J. Bailin, J. Binney, J. Bland-Hawthorn, **A. Brown**, W.

Dehnen, N. W. Evans, P. R. Fiorentin, M. Fiorucci, O. Gerhard, B. Gibson, A. Kelz, **K. Kuijken**, G. Matijevic, I. Minchev, Q. A. Parker, J. Penarrubia, A. Quillen, M. A. Read, W. Reid, S. Roeser, G. Ruchti, R.-D. Scholz, M. C. Smith, R. Sordo, E. Tolstoi, L. Tomasella, S. Vidrih, and E. W. de Boer, RAVE second data release (Zwitter+, 2008), *VizieR Online Data Catalog* **3257**.

X.5. Other Publications

D. van Delft, De afscheidsbrief van Paul Ehrenfest, *Nederlands Tijdschrift voor Natuurkunde*, January 2008, pp. 18-20.

D. van Delft, Little cup of helium, big science, *Physics Today*, March 2008, pp. 36-43.

D. van Delft, Zero-Point Energy: The Case of the Leiden Low-Temperature Laboratory of Heike Kamerlingh Onnes, *Annals of Science*, vol. 65, no. 3, July 2008, pp. 339-361.

D. van Delft, De vinger Gods zit in een luis - Book review of Luuc Kooijmans, *Gevaarlijke kennis; Inzicht en angst in de dagen van Jan Swammerdam* (Bert Bakker, 2007), *NRC Handelsblad*, bijlage boeken, 1 February 2008, pp. B06.

D. van Delft, Het Leidse halvium, *Jaarboek Rino* 2008, pp. 74-76.

D. van Delft, Book review of Liba Taub; Frances Willmoth, *The Whipple Museum of the History of Science* (Cambridge University Press, 2006), *Isis* 99, 2008, pp. 227-228.

D. van Delft, Een theekopje helium, *Eureka!* 22, pp. 14-16.

D. van Delft, Wie was Heike Kamerlingh Onnes?, *RCC-Koude & Luchtbehandeling* 101, no. 9, September 2008, pp. 22-24.

D. van Delft, Heike Kamerlingh Onnes en de Nederlandse Vereniging voor oude, *RCC Koude en Luchtbehandeling* 101, nr.9, September 2008, pp. 14.

D. van Delft, Wat Shakespeare zegt over de trilobiet - Book review of Richard Dawkins (ed.), *The Oxford Book of Modern Science Writing* (Oxford University Press, 2008), *NRC Handelsblad*, bijlage boeken, 3 October 2008, pp. B10.

D. van Delft, Jongensboek, Flow - magazine over gassen en bedrijfsprocessen, Fall 2008, pp. 27.

D. van Delft, Kamerlingh Onnes tegen de overheid, Tijdschrift openbaar bestuur 11, 2008, pp. 20-26.

D. van Delft, Einsteins liefde voor Leiden, Leidraad - Magazine van de Universiteit Leiden, Fall 2008, pp. 46-49.

D. van Delft, Een onderzoeker is geen Frankenstein, NRC next, 26 September 2008, pp. 19.

D. van Delft, Faust en Frankenstein blijven onze vijand, NRC Handelsblad, 29 September 2008, pp. 6.

D. van Delft, Wetenschap per slakkenpost - Book review of Anne Kox (ed.), The Scientific Correspondence of H.A. Lorentz, Volume I (Springer 2008), NRC Handelsblad, bijlage Wetenschap, 13 December 2008, pp. W11.

D. van Delft, The Liquefaction of Helium, Europhysicsnews, vol. 39, no. 6, 2008, pp. 23-25.

D. van Delft, 1908. The first Congress of Refrigeration, 100 years at the service of the development of refrigeration and its applications, Brochure for a conference of the International Institute of Refrigeration, 2008, pp. 4-7.

D. van Delft, Un physicien mathématicien ouvre grand les fenêtres: Robbert Dijkgraaf, Septentrion, 37/4, 2008, pp. 89-91.

R. Blandford, J. Kormendy and **E.F. van Dishoeck**, Preface, Annual Review of Astronomy and Astrophysics **46**, 2008, pp. V-VI.

F. van Lunteren, Newtons kip en Einsteins kapsel, Eureka! 23, 2008, pp.10-12.