



Scientific Report 2006

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Mission Concept and Support

The Lorentz Center is an international center aiming to coordinate and host workshops in the sciences, based on the philosophy that science thrives on personal interaction between creative researchers. Lorentz Center workshops focus on new collaborations and interactions between scientists from different countries, fields, and levels of seniority.

The Lorentz Center concept

In order to allow both junior and senior researchers to catch up with the rapid international developments and to establish new contacts and collaboration, Lorentz Center workshops bring together groups of 20 to 50 junior and senior researchers, typically for a period of one to two weeks, in a stimulating environment with working space for all participants: offices with a desk, personal computer, white boards, meeting rooms. Through a combination of informal talks, working sessions, tutorials and discussions, participants are able to assess the status of a field and its future, and to collaborate, establish new international contacts, and spot upcoming talent. The Lorentz Center actively promotes the public awareness of science and is also open to workshops addressing this issue.

Workshops can be proposed and organized by any researcher from any country. Workshops organized by researchers from different backgrounds and nationalities are encouraged. The proposals for the workshops and their scientific programs are reviewed by Program Advisory Boards. Currently there are Advisory Boards for astronomy, computer science, life sciences, mathematics and physics, but the Center is also open to proposals outside these fields. Submission procedures are aimed at rapid evaluation.

Surrounded by excellence

The Lorentz Center is located in Leiden University's J.H. Oort Building which also hosts the Instituut-Lorentz for theoretical physics, the Kamerlingh Onnes Laboratory and the Leiden Observatory. The Mathematics and Chemistry Departments and the Leiden Institute of Advanced Computer Science are located in adjacent buildings. All Dutch universities and research institutes can easily be reached by public transport; the universities in Amsterdam, Utrecht, Delft and Rotterdam can be reached by train within an hour. Schiphol International Airport is only 15 minutes by train.

Collaboration with NIAS

In collaboration with the social sciences and humanities institute NIAS located nearby, the Lorentz Center welcomes proposals for interdisciplinary workshops that bring together one or more disciplines of the Lorentz Center with those of the NIAS. Lorentz Fellowships are awarded by NIAS to scholars who are engaged in research across the boundaries of the humanities, the social sciences and the natural sciences. As part of the fellowship, the Lorentz Fellow is offered the opportunity to organize an interdisciplinary workshop at the Lorentz Center. Applications for Lorentz Fellowships should be sent to NIAS.

Support

The Lorentz Center is supported by Leiden University, FOM, the Dutch Physics Funding Foundation "Fundamenteel Onderzoek der Materie", NWO, Research Council EW.

The Lorentz Fonds regularly supports workshops in Physics.

Foreword by the director

This scientific report for the year 2006, reflects the fact that the Lorentz Center has entered a new phase of expansion and change in the course of the year. This was facilitated by a generous 5-year grant totaling 1.8 million Euro awarded by Mrs. M. A. van der Hoeven, the Dutch minister of education, culture and science, to the Lorentz Center in April 2006. This subsidy will allow the Lorentz Center to improve the service and support it provides, and to expand its mission. Indeed, part of the money will allow us to enhance the quality and organization of the workshops in the natural sciences by providing more financial support for individual workshops. This will, in particular, make it easier for the Lorentz Center to attract workshop proposals from outside the Netherlands, because foreign applicants are usually more dependent on the Lorentz Center budget as they usually have very limited access to Dutch funding agencies. An excellent example of such a high level workshop which was originally proposed to us by colleagues from the USA is the one on *Quantum Criticality* which was held in August.

We were proud that minister Van der Hoeven even took the trouble to express her support for our center in person, as she came for a working visit to the Lorentz Center in October, enabling her to learn first hand about the Lorentz Center and its mission and to talk to some of the participants of the *Universe Awareness* workshop that week. She then took the opportunity to formally announce that she had decided to give a special subsidy to this international project which aims to give many children in Europe and the emerging world a feel for the enormity and beauty of the universe. She also met with several participants of the "Verandering" project, aimed at Dutch school children and meant to stimulate their interest in the sciences.

Moreover, the support of the minister provided the impetus for the NIAS (*Netherlands Institute for Advanced Study* in the Humanities and Social Sciences), the Lorentz Center and their respective parent organizations KNAW (Royal Dutch Academy of Sciences) and Leiden University to sign a formal agreement in the summer of 2006 for jointly organizing interdisciplinary activities. Besides the ministry, also the KNAW contributed to make this unique cooperation possible. NIAS has created two *Lorentz Fellowships* to host fellows who will use their stay at the NIAS to study a subject, which touches on or has strong links with the sciences. In addition, the Lorentz Center will host several cross-disciplinary workshops each year. The first workshop of this type, *Geometric Patterns in Islamic Art* was co-organized by one of the first two Lorentz Fellows at NIAS, while several present and former NIAS fellows played an important part in the organization of the other two interdisciplinary workshops held in the fall of 2006, *Perspectives on Scientific Practice from Science and the Science Studies* and *Games, Action and Social Software*. Even though we are still learning to find the optimal format for organizing such interdisciplinary workshops, these first three workshops were considered a big success by participants and organizers – many new contacts were established. The topic of the *Geometric Patterns in the Islamic Art* workshop clearly resonated with the public as well: after the publication of a full-page cover story in the September 2nd issue of the science section of one of the leading national newspapers, NRC Handelsblad, many people called the Lorentz Center to express interest in attending some of the sessions or to coming to see the artwork on display during the workshop.

The interdisciplinary collaboration program of the Lorentz Center and NIAS is overseen by a high level program advisory board, the members of which are listed in the report.

The establishment of a second new advisory board marks the expansion of the mission of the Lorentz Center into life sciences. The life sciences program advisory board, which met for the first time in the fall of 2006, has decided that life sciences activities at the Lorentz Center should focus in particular on workshops that make an effort to bring together otherwise separate communities and disciplines in order to advance research on well-defined exciting topics. In anticipation of the official extension of our mission to the life sciences, we had some noteworthy workshops this year, such as the biology workshop on *Transcriptomics and Proteomics in Zebrafish* and the biophysics workshop on *Soft Condensed Matter Physics in Molecular and Cell Biology*. Since the Lorentz Center format and workshop model does not exist as yet in life sciences, neither in the Netherlands nor in other countries, many of our colleagues expect to see a rapid growth of life sciences workshops in the coming years.

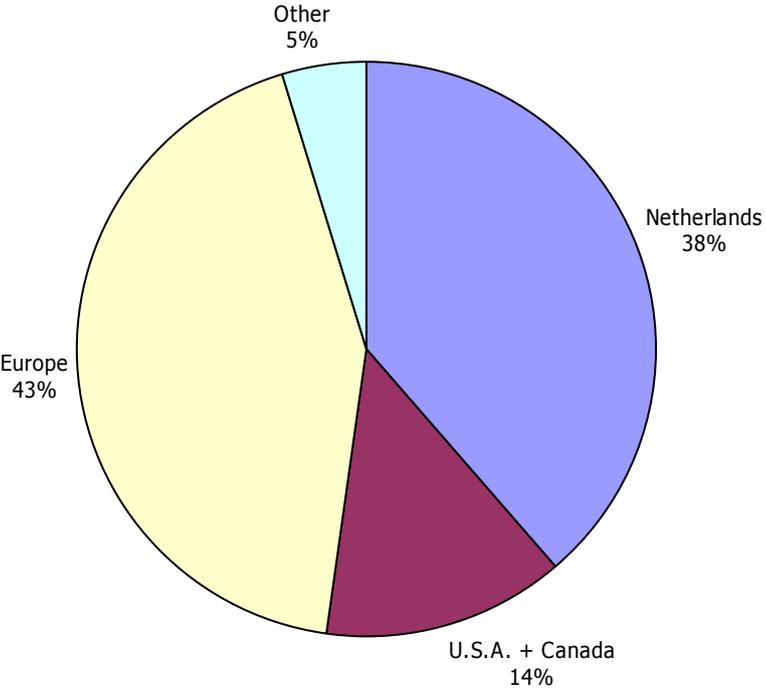
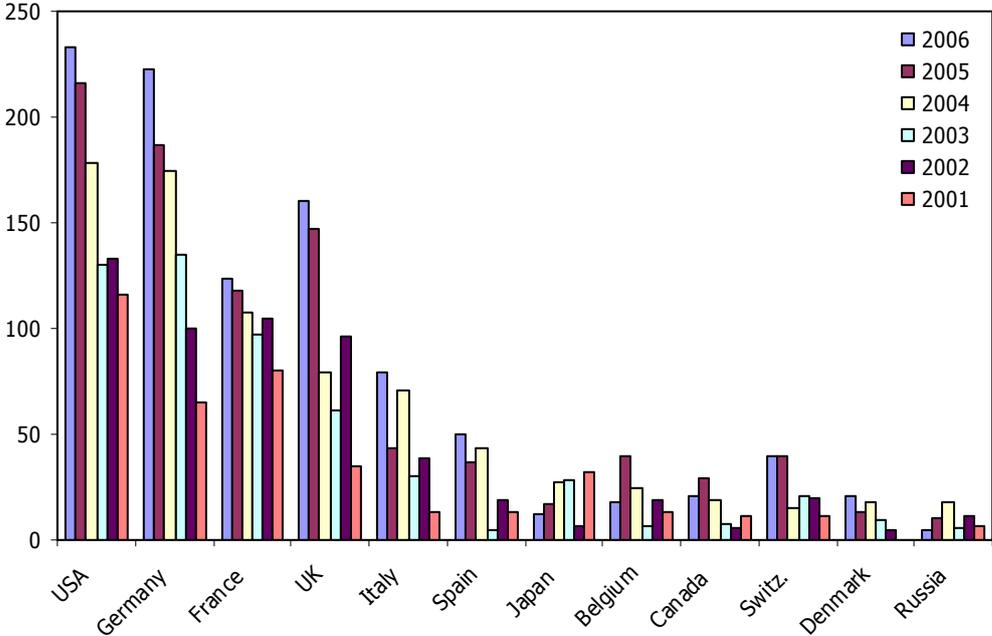
These last few years, we have seen a steady increase in the number of proposals received. In view of the expansion into life sciences and of the collaboration with NIAS, we expect to soon approach the point where competition for a timeslot at the Lorentz Center will go up significantly. Anticipating this, we have, at the suggestion of various program advisory boards, decided to switch from the evaluation of proposals on a one-by-one basis to a system of three evaluation rounds per year. Thus we will make it easier for the board members to compare and rank the proposals within their discipline. The deadlines for these evaluation rounds are January 15, May 15 and September 15, and we strive to take a go/no-go decision on a proposal about a month after each deadline.

It has always been our policy that our workshop programs are open to anyone from the Netherlands who is interested in participating or who wants to attend a few talks. In order to make it easier for scientists to stay informed about what is happening at the Lorentz Center, we have introduced the possibility to sign up for automatic email announcements of workshops in a particular field. These announcements are sent out once the program of a workshop has been published on the web, usually a couple of weeks before a workshop begins. Interested parties can sign up for such workshop announcements by email at <http://www.lorentzcenter.nl/email.php>.

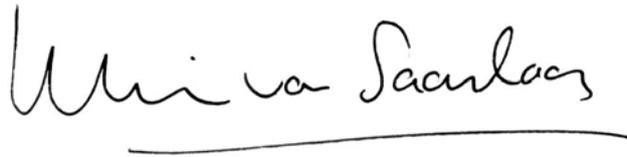
The advantage of the fact that the Lorentz Center is housed in the buildings of the faculty of sciences of Leiden University, is that the barrier for scientific interactions of the workshop participants with the local staff, postdocs and students is small. To promote such exchange even more, together with the dean of our science faculty we have started the "Lorentz Center highlights": prominent participants of our workshops are regularly invited to give a short presentation about their research or on the topic of the workshop, at the faculty-wide Tuesday lunch colloquium. These highlights are always very well attended and are considered a big success.

YEAR	2000	2001	2002	2003	2004	2005	2006
Number of Meetings	23	31	34	31	38	41	45
Number of Workshops	15	21	23	22	31	35	41
Number of Visitors	880	1002	1421	1436	1640	1693	2009
Reg. workshop participants	640	735	1005	1007	1133	1562	1729

Our continuous expansion of activities is reflected in the table on the previous page, which shows that the number of workshops and of visitors was larger again than the previous year. As before, the spread in the countries of origin of our participants, shown in the following figures, continues to be remarkably stable – we consider this evidence of the appeal of our workshops to the international science community and of the topics of our workshops being at the forefront of worldwide scientific developments. It is also worth noting that 35% of the registered participants are young researchers, PhD students and postdocs.



It should be clear from the above that all Lorentz Center staff look to the future with excitement and great confidence. I invite you to now overlook 2006 by browsing through the reports of the last year's workshops – as, evidently, besides the workshops mentioned above in connection with the extension of our mission, we have had a large number of very successful and stimulating workshops in our original fields, astronomy, computer science, mathematics and physics.

A handwritten signature in black ink that reads "Wim van Saarloos". The signature is written in a cursive style and is underlined with a single horizontal line.

Wim van Saarloos
Director Lorentz Center

February 2007

Program Board for Physics

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Program Board for Life Sciences

Chair

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M.A. Peletier	Technische Universiteit Eindhoven
W.J.M. Spaan	LUMC, Leiden
H.G. Stunnenberg	Radboud Universiteit, Nijmegen
L.E.M. Vet	NIOO, Nieuwersluis and Wageningen University

Interdisciplinary Program Board

The interdisciplinary program board oversees the collaboration of NIAS (Netherlands Institute for Advanced Study in the Humanities and Social Sciences) and Lorentz Center, including the selection of interdisciplinary workshops, and the selection of the Lorentz Fellows at NIAS.

Chair

A.H.G. Rinnooy Kan Sociaal Economische Raad Den Haag

Members

J. Bouma	Wageningen Universiteit
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K. van Berkel	Rijksuniversiteit Groningen
D. van Delft	Museum Boerhaave Leiden
R. van der Ploeg	European University Institute San Domenico di Fiesole
L.C. Verbrugge	Rijksuniversiteit Groningen

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Herschel Key Program

February 20 – 23, 2006

The "Herschel Key Programs Workshop", organized by the HIFI consortium, took place in the Lorentz Center from 20 to 23 February 2006. The Herschel Space Observatory, an ESA cornerstone mission, is the first space facility dedicated to the submillimetre and far-infrared wavelength range, and will be operated as a multi-user astronomical observatory that will provide observation opportunities to the entire astronomical community. The launch is scheduled for 2008. It will carry a 3.5 metre passively cooled telescope, and will perform imaging photometry and spectrometry in the far-infrared and submillimetre part of the spectrum, covering approximately the 60-670 micrometres range. The science payload consists of three instruments which will be provided by consortia led by Principal Investigators: The Heterodyne Instrument for the Far-Infrared, HIFI, whose PI is Th. de Graauw, SRON, Groningen, The Netherlands; the Photodetector Array Camera and Spectrometer, PACS, whose PI is A. Poglitsch, MPE, Garching, Germany; and the Spectral and Photometric Imaging REceiver, SPIRE, whose PI is M. Griffin, Cardiff University, UK. Because of our limited knowledge of the astronomical sky at far-infrared and sub-millimetre wavelengths, the Herschel mission is often referred to as "being its own precursor". As a consequence of this, large coherent observing programs will be an essential part of the operational program of Herschel.

The main purpose of the workshop was to provide an overview of the state of the key programs developed by the three instrument consortia and to facilitate and coordinate the interaction between the groups involved. The workshop brought together Co-Investigators from the three Herschel instruments and members of the Herschel Science Centre involved in these Key Programs. Each day featured one or two different, broad scientific themes.

20 February: Solar System - All day

20 February: Herschel GT-O KP on Debris Disks

21 February: Star formation Water

21 February: Star formation Spectral Survey

22 February: Star Formation coordination: Orion-SgrB2 followed by a first meeting on a GTO program on Orion-SGrB2 mapping

23 February: ISM coordination

Some 40 scientists from Belgium, Canada, France, Germany, Italy, the Netherlands, Spain, Sweden, the United Kingdom, the United States, attended the meeting. Each day started with presentations of the relevant key programs in the different instrument teams, their observing strategies, analysis tools, and preparatory science. This was followed by detailed discussions on the coordination of the observing source lists, the spectral line lists, data rights, and joint publication policies. The workshop achieved its objectives and definitely helped in determining the future path for the preparation of the Key Program proposals. Detailed actions were assigned to follow up on the key issues.

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We would like to thank the Lorentz Center staff, Dr. Martje Kruk-de Bruin and Stephanie Hessing for their professional and efficient support, and very specially for their patience with the organizers and their hospitality and readiness to discuss any aspect of the local organization. The excellent facilities and good atmosphere of the Lorentz Center clearly contributed to the success of the workshop.

T. de Graauw (Groningen University, Netherlands)

M. Griffin (University Cardiff, UK)

P. Harvey (University of Texas, USA)

F.P. Helmich (SRON, Netherlands)

G. Pilbratt (ESA, Netherlands)

A. Poglitsch (MPE, Germany)

X. Tielens (Groningen University, Netherlands)

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The World a Jigsaw: Tessellations in the Sciences

March 6 – 10, 2006

From Monday March 6 till Friday March 10, 2006, the Lorentz Center workshop gathered around 40-50 people from a variety of disciplines around the common theme of tessellations and their application within the sciences.

The scientific organization of the meeting has been in the hands of prof. Gert Vegter (IWI, Groningen) and prof. Rien van de Weygaert (Kapteyn Institute, Groningen), assisted by prof. Vincent Icke and drs. Jelle Ritzerveld of Leiden Observatory. Also we have been able to profit from the scientific advice given by prof. Jesper Møller (Aalborg, Denmark), prof. Malcolm Sambridge (Canberra, Australia) and prof. Sung N. Chiu (Hongkong). Up to the workshop itself Wies Groeneboer has been our workshop assistant, the last days of the workshop Stephanie Hessing took over as workshop assistant, while dr. Martje Kruk supervised the organization.

After obtaining the approval by all four boards of the Lorentz Center – mathematics, computer sciences, physics and astronomy – we set to work with setting up both the scientific program as well as the funding. The interdisciplinary nature of the workshop made it into a substantial challenge to put together a program answering the ambitions of the organizers. At first our knowledge of the concept of tessellations centered around astronomy and astrophysics, with the addition of a few prominent experts in stochastic geometry (Møller and Stoyan) and in geophysics (Sambridge). This impelled van de Weygaert to invite Vegter to join the organization, which was crucial for finding the essential contacts in the fields of computational geometry and visualization. On the basis of this we assured ourselves of the presence of some of the most prominent experts in these fields. Amongst others this concerned Boissonnat, Alliez, Edelsbrunner and Amenta. In addition we set about to identify prominent scientists in other areas who had booked substantial results with the application of tessellations. In general we succeeded in gathering an attractive group from various areas in physics (General Relativity and Regge calculus, quantum gravity, quasicrystals and aperiodic tessellations, hydrodynamics, foam physics), biology and biophysics (cancer cell growth, protein identification, plant growth), archaeology (reconstruction artefacts, shape identification), and geographical information systems and gsm networks.

In addition to the major share taken up by the Lorentz Center, we succeeded to obtain funding from a variety of additional sources. NWO, NOVA, KNAW (Royal Academy of Arts and Sciences), the Kapteyn leerstoel (Piet van der Kruit), the IWI (Groningen Institute for Mathematics and Computer Science) and finally the Central Board (CvB) of Leiden University provided us with sufficient funding for an ambitious program and enabled us to substantiate the success in an edited volume of reviews to be published by Springer Verlag.

Already on the first day of the workshop it became apparent that the goal of the organizers, to bring about lively cross-disciplinary discussions and exchanges of ideas, got fulfilled. Various participants used words like "thrilling", "exciting" and even "mind-expanding". The fact that participants found their interest in tessellations, in particular Voronoi and Delaunay, reflected in other branches of science, even induced amazement. Representatives from computer science found that their work was in fact highly relevant for many applications in the diverse disciplines, representatives of the various disciplines found new ideas and applications in other sciences. Perhaps most telling was the reaction of M. Sambridge, who

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before leaving, discussed about the possibility of following this up in a kind of (web) network for exchange of ideas and techniques. It certainly inspired us to think about the possibility of organizing a follow-up meeting (perhaps different context) in some years. The meeting itself may thus very well evolve into a kick-off meeting for such a tessellation network, has certainly provoked various cross-disciplinary collaborations, and may very well lead to a burst of new activity in and across the various fields of expertise.

As part of the general program we had included two "cultural", yet related events in the program. Tessellations play a large role in Arabic Islamic art, and we found prof. van de Craats prepared to present a public lecture on Islamic tessellations and ornaments on tuesday evening March 7. Also the conference dinner on thursday evening March 9, in a restaurant on the Pier of Scheveningen, got combined with a cultural diversion, a guided tour for all participants through the Escher museum in the Hague, "Escher in het Paleis" (1 1/2 hours). It needs no explanation that amongst the participants of a meeting on tessellations Escher's work (and his use of tessellations) could count on a lot of interest. The meeting included also one other additional item, the first talk in the special series "Lorentz Center Highlights", in the weekly program of faculty talks of the faculty of sciences of Leiden University "This week's Discoveries".

The meeting also obtained some press coverage, in an article in the NRC Handelsblad. As indicated before, Vegter and van de Weygaert are working on defining an edited volume of reviews by (combinations) of participants. Springer Verlag will publish these.

Many of the participants have in the meantime sent enthusiastic responses on the meeting, nearly always accompanied by highly appreciative comments on the context and facilities of the Lorentz Center and the wonderful organizational assistance by the Center.

R. van de Weygaert (Groningen University, Netherlands)

V. Icke (Leiden University, Netherlands)

G. Vegter (Groningen University, Netherlands)

J. Ritzerveld (Leiden University, Netherlands)

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Key Programs of the HIFI instrument

April 3 – 7, 2006

The workshop on "Key Programs of the HIFI instrument", organized by the HIFI consortium, took place in the Lorentz Center from April 3-7, 2006. The Herschel Space Observatory, an ESA cornerstone mission, is the first space facility dedicated to the submillimetre and far-infrared wavelength range, and will be operated as a multi-user astronomical observatory that will provide observation opportunities to the entire astronomical community. The launch is scheduled for 2008. It will carry a 3.5 metre passively cooled telescope, and will perform imaging photometry and spectrometry in the far-infrared and submillimetre part of the spectrum, covering approximately the 60-670 micrometres range. The Heterodyne Instrument for the Far-Infrared, HIFI - PI: Th. de Graauw, SRON, Groningen, The Netherlands - will provide spectral coverage of the sub-millimeter spectral range at sub-kilometer-per-second resolution. Because of our limited knowledge of the astronomical sky at far-infrared and sub-millimetre wavelengths, the Herschel mission is often referred to as "being its own precursor". As a consequence of this, large coherent observing programs will be an essential part of the operational program of Herschel.

Over the years, detailed programs for the guaranteed time associated with HIFI have been developed in the areas of solar system science, the physics and chemistry of regions of star formation - in particular water and spectral surveys -, circumstellar matter around late type stars, and the physics and chemistry of the interstellar medium in our own galaxy and other galaxies. The goal of this workshop is to review the status of these programs, and specifically the target samples and required integration times. This workshop is expected to lead to detailed plans to complete the proposals, which have to be submitted by July 1, 2006. The workshop brought together HIFI Co-Investigators involved in these Key Programs. Each day featured one or two different, broad scientific themes.

Monday April 3rd, 2006

Solar System & Extragalactic studies (Galactic nuclei & low metal systems) & Interstellar Medium - ISM - (molecular carriers)

Tuesday April 4th, 2006

Interstellar Medium (warm ISM & molecular carriers)

Wednesday April 5th, 2006

Unbiased spectral surveys of regions of star formation

Thursday April 6th, 2006

Orion/ Sgr B2 & Water in regions of star formation

Friday April 7th, 2006

Water in regions of star formation

Some 70 scientists from Canada, France, Germany, Greece, Italy, the Netherlands, Spain, Sweden, and the United States, attended the meeting. For each topic, the program consists of an overview of the status of the overall program as well as the different subprograms involved by their coordinators. Discussions focussed on open issues including observing strategies, source samples, spectral lines lists, data rights, joint publication policies, analysis

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tools, and preparatory science. The workshop achieved its objectives on the Key Program proposals. Detailed actions were assigned to follow up on the key issues and to ensure that the proposals are finished in a timely manner.

We are very grateful to the Lorentz Center staff, Dr. Martje Kruk-de Bruin and Stephanie Hessing for their professional and efficient support, and for their hospitality and readiness to discuss any aspect of the local organization. The excellent facilities and good atmosphere of the Lorentz Center clearly contributed to the success of the workshop.

F.P.Helmich (SRON, Netherlands)

Th. de Graauw (Groningen University, Netherlands)

A.G.G.M. Tielens (Groningen University, Netherlands)

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Roadmap Workshop of the Dutch Entertainment Computing Consortium (DECC)

April 10 – 13, 2006

Introduction

This workshop aimed to define a roadmap in the field of entertainment computing for the mid- and long term future. The focus lied on four themes: (1) Entertainment & Health: e.g. children and obesity, pets for health care, mental health in isolation (i.e. ultra long flights, submarines, prison, etc). (2) Entertainment & Gaming: e.g. from chess to multi user games on internet. (3) Entertainment & Training: e.g. simulation environment, tools for managers, etc. (4) Entertainment & Sport.

The Workshop

About 30 people from The Netherlands, US and Germany attended the workshop: most of the participants were presenting their particular view on the required research in the mid- and long term future but observers were also invited to participate. The number of participants was small enough that a well coordinated pre-workshop preparation was possible. The participants of this workshop were divided over the different fields in entertainment computing (i.e., gaming, interactive art, multimedia, human computer interaction, simulation, etc). The fact that people from different disciplines (art, computing sciences, industrial design, psychology, human factors, etc) working on the same or related questions came together, resulted in a very lively exchange.

We had a full program with several lectures in the morning and discussion sessions in the afternoon; each discussion group addressed one of the themes above. Discussion leaders were assigned for each of these sessions. Their main job was to introduce the topic and start the discussion. Everyone then was free to contribute, either by discussion or by showing a few slides. The results were summarized by the discussion leaders in a short report as input for the roadmap.

Outcome of the Workshop

By the end of the workshop summaries of each discussion were drawn up by each discussion group leader, and the coordinator of each topic day gave a short presentation showing the main results coming out of the several discussions. The workshop definitely helped to exchange ideas and to generate high quality input for the roadmap. The participants were all enthusiastic about the meeting and its scientific level. In particular they were extremely pleased with the smooth, efficient and flexible organization by the management of the Lorentz Center. Again, this could only be achieved thanks to the generosity, infrastructure and outstanding organization of the Lorentz Center and of the people working there. Finally, the results of this roadmap effort will shortly be published on the website of DECC. We hope that all present and future Dutch research in the field of entertainment computing will take into consideration the outcome of this extremely successful workshop.

H.J. van den Herik (University of Maastricht, Netherlands)

A. Nijholt (University of Twente, Netherlands)

M. Rauterberg (Eindhoven University of Technology, Netherlands)

Nascholingsdag voor wiskundedocenten uit het voortgezet onderwijs Coderingstheorie en cryptografie

April 21, 2006

Op 21 april 2006 is op het Lorentz Center van de Universiteit Leiden door het Mathematisch Instituut de jaarlijkse nascholingsdag voor wiskundedocenten georganiseerd. Het onderwerp was dit jaar 'Coderingstheorie en cryptografie'. Inhoudelijk was de nascholingsdag, zoals gebruikelijk, gekoppeld aan de jaarlijkse masterclass, Master-PO genaamd, voor begaafde scholieren.

Tijdens de nascholingsdag is de wiskunde achter coderingstheorie en cryptografie behandeld, waarbij natuurlijk de zwakke en sterke punten van deze theorieën naar voren zijn gekomen. Gezien het feit dat de deelnemers les geven aan scholieren die, met het oog op de technologische ontwikkelingen, later zeer veel te maken zullen krijgen met zaken als betalen over internet en dergelijke, is het zinvol als ze in staat zijn tijdens of na de lessen achtergrondinformatie te geven over cryptografie. Na deze 21^{ste} april 2006 zijn de deelnemers dat!

Coderingstheorie is de kunst van het 'zo zuinig mogelijk' schokbestendig maken van een bericht dat door een onbetrouwbaar medium wordt verzonden. Denk hierbij aan een signaal dat van een sateliet komt. Door ruis zal zo'n signaal in principe enigszins beschadigd aankomen. Door redundante informatie toe te voegen is het mogelijk bij lichte beschadigingen het oorspronkelijke bericht terug te vinden. Het is de kunst deze redundante informatie een zo klein mogelijk deel van het totale bericht te laten zijn. Door bijvoorbeeld een bericht honderd keer te herhalen, zal het vast wel lukken beschadigingen weg te werken. De redundante informatie is dan echter 99% bericht, hetgeen bepaald 'sub-optimaal' is. Op de nascholingsdag is o.a. de (7,4) Hammingcode behandeld. Bij deze code beslaat de redundante informatie minder dan de helft van het totale bericht, terwijl het toch nog niet alleen een 1-fout constaterend is, maar zelfs 1-fout corrigerend! De wiskunde achter deze codes is niet diep, maar levert wel zeer nuttige resultaten op.

Het zwaarste deel van de dag betrof cryptografie. Cryptografie is de kunst van het 'geheimschrift'. In deze tijd van intensief internet gebruik een 'hot item'. Wanneer we goederen bestellen bij bijvoorbeeld Amazon.com en betalen over internet, willen we graag dat een spion niet onze gegevens kan afluisteren. Als we van tevoren privé met Amazon.com in een hoekje stiekum en afgezonderd afspraken kunnen maken over geheime sleutels en dergelijke, is het niet zo moeilijk daarna over internet geheimschrift te gebruiken dat niet te kraken is. Echter, zo'n gelegenheid doet zich in de praktijk niet voor. Vanaf het eerste moment dat we contact maken met Amazon.com over internet, moeten we er vanuit gaan dat de hele wereld onze communicatie kan afluisteren. Is het dan tóch mogelijk tot geheime, versleutelde communicatie te komen? Het antwoord op deze vraag (en vele andere in deze context) wordt door de wiskunde beantwoord met 'ja'. Dit antwoord wordt echter nadrukkelijk gegeven in de context van onze huidige computer-technologie en kennis van de wiskunde. Op de nascholingsdag is met name RSA-cryptografie behandeld. De kracht van RSA is in wezen op het volgende gebaseerd: het uitrekenen van 3 keer 5 is eenvoudig; het uitrekenen dat 15 de uitkomst is van 3 keer 5 is dat niet. Met 'eenvoudig' wordt hier bedoeld: goed en binnen afzienbare tijd uitvoerbaar met een computer. Nu voert een

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computer met de getallen 3, 5 en 15 de gevraagde berekeningen in een flits uit. Als we de getallen echter vervangen door andere getallen die uit veel (bijvoorbeeld 200) cijfers bestaan, verandert de zaak. Twee getallen van 200 cijfers met elkaar vermenigvuldigen, doet een computer nog steeds in een flits. Echter, een (willekeurig genoeg gekozen) getal van 200 cijfers ontbinden in factoren vraagt wat meer tijd. Hierbij moet niet worden gedacht in minuten, uren, jaren of millennia, maar meer in termen van vele malen de leeftijd van het universum. Het praktische probleem is evident.

Tijdens de nascholingsdag hebben de deelnemers zich dus verdiept in de wiskunde achter coderingstheorie en cryptografie en hebben dit in verband gebracht met de dagelijkse praktijk. Dit heeft beslist inspirerend gewerkt op zowel de deelnemers alsook de organisatie. Een aantal docenten heeft al aangegeven met de opgedane stof iets te willen gaan doen met hun leerlingen. Hopelijk draagt het enthousiasme van deze docenten bij aan het verbeteren van het imago van bèta-vakken bij scholieren.

Volgend jaar een nieuwe nascholingsdag!

H. Finkelberg (Leiden University, Netherlands)

Scientific Report

Limit Problems in Analysis

May 1 – 5, 2006

In all quantitative sciences there is an abundance of problems which either contain a small parameter (e.g. dictated by an application) or itself evolve towards a special limit, for example as time tends to infinity or when a singularity in the dynamics occurs. In these asymptotic limits the problem reduces to a simpler one, at least in a formal calculation. The reverse side of this coin is that these formal computations often cannot be converted into a rigorous proof. The focus of this workshop was on the Combination of formal methods and mathematically rigorous proofs in (more or less) applied analysis.

As an example one may think of differential equations on manifolds, or equations that describe the evolution of a manifold itself. In the former case the topology of the manifold can "drive" the solution towards a singularity. In the latter case a singularity in the topology of the manifold can occur, and the singular limit then consists of zooming in on the point (in time and space) where the topology changes. Thoroughly analyzing such singularities is important in, for example, the understanding of the Ricci flow, which has lately drawn a lot of attention because of its role in the proof of the Poincaré conjecture.

The workshop did not revolve around a specific equation, but rather aimed at bringing together a group of young mathematicians, some with a background in formal methods, others with a more pure mathematical training. There were 30 talks, of which 23 were by young participants, with several additional (non-speaking) experts attending for a few days. The group was truly international and intercontinental with attendance from USA (7), UK (6), Canada (4), Germany (4), Italy (3), France (2), China (1) and Belgium (1). Furthermore, there were 5 speakers from the Netherlands with many more local people attending, including several students (PhD and Master) from universities in the Netherlands.

By keeping the length of the talks short, an informal atmosphere of questions and discussions was created where there was lots of time for scientific and social interaction. Since there were many young researchers present at the workshop, it was especially important to have ample opportunity for meeting new people and getting introduced to (and impressed by) their work, as well as to look for common ground.

A variety of topics was touched upon in the workshop. Let us mention a few scientific highlights:

- On moving interface problems, Dejan Slepcev and Hans Knüpfer showed how energy estimates can be used to prove powerful results about the spreading of droplets described by the thin film equation.
- The emergence, splitting and interaction of pulses in reaction diffusion equations was discussed by several speakers in a variety of asymptotic regimes.
- In a crystal clear talk Jon Chapman explained asymptotics beyond all orders and exponentially small terms, linking it with the Stokes phenomenon, and applying it to the snaking diagram in the Swift-Hohenberg equation.

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- Concerning geometric flows, there were talks by Stephen Gustafson and Peter Topping on the Harmonic map, Schrödinger and the Ricci flow respectively, explaining their rigorous analysis of singularity formation.
- Jens Rademacher and Hartmut Schwetlick presented two very different views on lattice dynamics, one using analogies from differential equations for continuous systems, the other via variational methods.
- In a series of talks by Didier Smets, Giandomenico Orlandi and Daniel Spirn the very latest new developments on the elliptic, parabolic and Schrödinger versions of the Ginzburg-Landau equation were presented.

The workshop indeed brought together a group of young mathematicians, who have expertise in a particular field (rigorous, formal or applied) or are interested in combining rigorous and formal approaches. After the workshop we have received many emails with positive feedback. People especially liked the "free" time in the workshop program and the office space which made it much easier to discuss research at length than at ordinary conferences. Also, meeting people from different backgrounds was greatly appreciated. We have no doubt that new collaborations will result and existing ones have evolved.

J.B. van den Berg (VU, Amsterdam, Netherlands)

J.F. Williams (Simon Fraser University, Vancouver, Canada)

Scientific Report

Soft Condensed Matter Physics in Molecular and Cell Biology

May 8 – 12, 2006

The purpose of this workshop was to bring together experts in experiment, theory and computer simulation that work on Molecular and Cell Biology with the methods of Soft Condensed Matter Physics. There were 45 participants among which 15 from the Netherlands, 12 from Germany, 7 from United Kingdom, 5 from the United States, 4 from France, 1 from Czech Republic and 1 from Israel.

Biophysics being a timely topic, now and for many years to come, made this workshop a very lively experience. The five day workshop had four talks per day leaving plenty of space for discussions after (and during) each talk. Also the big slot of free time between the two morning and the two afternoon talks was an important feature of the workshop and allowed many discussions between participants. The setting of the Lorentz center with many offices, blackboards and a spacious coffee room turned out to be ideal for this. We expect that this workshop has spurred numerous new collaborations between various participants.

The 19 talks were divided into roughly four different subjects that were close enough to keep everybody interested in all of the talks:

Day 1: From DNA to chromatin (4 talks): Chromatin fibers have now become accessible to micromanipulation experiments as well as to computer simulations. This day was designed to bring together 4 different research groups on the chromatin 30 nm fiber with many conflicting ideas and views.

Day 2: Cellular self organisation (4 talks): Theorist and experimentalists presented results on how a cell finds its midplane when it is going to divide and how bacteria can detect food gradients. This day turned out to feature several extremely lively debates.

Day 3: Physics of viruses (4 talks): This day was devoted to viruses, especially what determines its size, stability and the beautiful geometries of the maturation its capsid.

Day 4 and 5: Biological membranes and cytoskeleton (7 talks): This group of talks was related to two subjects, membranes and the cytoskeleton, that are, however, intimately linked. Experiments, computer models and theories included the transport of vesicles along actin and microtubuli, the formation of membrane tubes and how the membrane shape is controlled by the underlying cytoskeleton.

Many participants said that this kind of workshop is ideal. In fact, the audience was lively discussing after all the talks -- from the first to the very last one. We hope and believe that several participants got inspired to organize in the future also such a workshop at the Lorentz center.

This workshop would not have been possible without the financial support of the Lorentz center. Especially we would like to mention the extremely efficient and smooth organization of this workshop through the friendly staff of the Lorentz center, especially through the program assistant Stephanie Hessing and the executive manager Dr. Martje Kruk-de Bruin.

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Last but not least we are thankful to the speakers who – without exception – presented exciting and stimulating talks.

M. Howard (Imperial College London, UK)

T. B. Liverpool (University of Leeds, UK)

F. C. MacKintosh (Vrije Universiteit Amsterdam, Netherlands)

H. Schiessel (Leiden University, Netherlands)

D. R. Nelson (Harvard University, USA)

Scientific Report

Computational and topological aspects of dynamics

May 15 – 19, 2006

Dynamical systems appear as mathematical models in every area of the natural sciences. In recent years our knowledge of dynamical systems and its links with topology has made tremendous progress. Advances in geometry, knot theory and computational topology are finding applications in the study of dynamical systems. The topological information turns out to have essential implications for observed phenomena such as stationary, periodic and chaotic solutions. In order to understand the observed long term behavior in a dynamical system, it is crucial to analyze the invariant dynamics of the system and its dependence on parameters. The reason is that the invariant dynamics, the bounded motions which exist for all (forward and backward) time, often form the global attractor for all motions. Usually these orbits have better properties than arbitrary orbits, exhibiting topological structures which carry essential information and/or converting the study of an infinite dimensional system to a finite dimensional setting. An important aspect is the computability of topological information. Numerical simulations are a relatively easy way to explore the phenomena exhibited by a particular dynamical systems, but such computations do not reveal any of the reasons for the observed behavior. On the other hand, topological techniques give a deeper understanding of the underlying structure and capture the behavior of broad families of systems. To combine these two approaches one must be able to find topological information in a computationally robust manner. Arguments from topology can then be used to justify specific features seen in the numerical simulations.

List of participants

Speakers:

• W.D. Kalies, Florida Atlantic University, Boca Raton (USA). • S. Day, Cornell University, Ithaca (USA). • O. Junge, University of Paderborn (Germany). • S.B. Angenent, University of Wisconsin, Madison (USA). • R.W. Ghrist, University of Illinois, Urbana Champaign (USA). • K. Mischaikow, Georgia Institute of Technology, Atlanta (USA). • Z. Arai, Kyoto University (Japan). • F. Pasquotto, Vrije University, Amsterdam (Netherlands). • H. Ban, Florida Atlantic University, Boca Raton (USA). • J. Lessard, Georgia Institute of Technology, Atlanta (USA). • J. Thiffeault, Imperial College, London (UK). • P. Majer, University of Pisa, Pisa, (Italy). • O. Cornea, University of Montreal (Canada) • J. Lamb, Imperial College (UK) • F. Schlenk, University of Brussels (Belgium) • T. Hall, University of Liverpool (UK) • Ph. Boyland, University of Florida (USA) • B. Buffoni Ecole Polytechnique Lausanne (Switzerland) • B. Rink, Imperial College (UK)

Non-speakers:

• P. Collins • W. Wojcik • M. Kramar • V. Guyonne • H. Elrofai • M. Wess • J. Hulshof

The workshop

The main subjects of the contributed talks were computational topology, Conley index theory, Hamiltonian systems, variational methods, braids and knots in dynamics.

The workshop consisted of five days of talks, four per day, 45 minutes per talk. Due to the relatively small number of participants the time in between talks was a good opportunity for the participant to discuss mathematics. The reaction of participants was that the schedule was ideal.

We chose the subjects per day to be a mix between more theoretical subjects and computational subjects. This combination was advantageous for bringing together these two

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groups of researchers. For example the talk by Thiffeault revealed a new approach to train-tracks, which was the subject of the talk by Hall.

The environment of the Lorentz Center was ideal for workshops of this size and philosophy; spacious offices, lounge, secretarial support, etc.

The reactions of the participants afterwards were very positive and the intention of organizing a follow-up workshop a few years down the road seems to be very likely.

Organizing the workshop has been a great pleasure due to the support of the Lorentz Center staff, Martje Kruk en Gerda Filippo. They took care of all local arrangements such as lodging, directions, schedules, bike rentals, etc.

The workshop was for most part financed by the Lorentz Center. Other financial support came for the cluster NDNS+.

J.B. van den Berg (VU, Amsterdam, Netherlands)

R.C.A.M. van der Vorst (VU, Amsterdam, Netherlands)

Scientific Report

Beyond the Quantum

May 29 – June 2, 2006

The participants were obviously pleased to participate in discussions fully devoted to foundational questions, so that the meeting took place in an exciting atmosphere.

The point stressed in the opening address that, though experimentalists perform individual measurements, no theory exists to account for an individual quantum measurement process, was by many seen as a decisive argument to justify studies that go Beyond the Quantum.

The scope of subjects exposed the participants to one another's subfields: quantum gravity and black hole information paradox, quantum optical measurements and theoretical quantum measurements, Bell inequalities and (loophole free) Bell experiments, classical statistical models to describe quantum mechanics, stochastic electrodynamics and stochastic optics, Bohmian mechanics and Kerr-Newman type models for the electron.

The confrontation of such a variety of topics has been a distinctive feature of this meeting.

The meeting was closed with a lively round table discussion moderated by G. 't Hooft. Its transcript will appear in the proceedings and on the web.

The proceedings entitled "Beyond the Quantum", containing 30 contributed articles and some 400 pages, and edited by Th.M. Nieuwenhuizen, V. Spicka, B. Mehmami, M. Aghdami-Jafar and A. Yu. Khrennikov, will be published by World Scientific, 2007.

Th.M. Nieuwenhuizen (University of Amsterdam, Netherlands)

R. Balian (CEA Saclay, Academie des Sciences, France)

A.M. Cetto (IAEA, Austria)

G. 't Hooft (Universiteit Utrecht, Netherlands)

A.Yu. Khrennikov (Vaxjo University, Sweden)

Scientific Report

Rings of Low Rank

June 6 – 16, 2006

The goal of the workshop was to better understand the amazing work of Manjul Bhargava (Princeton) on rings of low rank, and to explore its impact on computational number theory. Manjul Bhargava was the Stieltjes Visiting Professor 2006 at the Mathematical Institute in Leiden.

The workshop consisted of two parts. The first part was tutorial in nature at PhD student level. It served as preparation for the second week which consisted of lectures and discussions at research level.

The first part, held from June 6 to 9 followed the “Stieltjes Week” format: it was tutorial in nature, aimed at advanced graduate students, primarily but not exclusively from the Netherlands. In the morning specialized lectures were given, followed by discussion and exercise sessions in the afternoon. The subject material was detailed in two short series of lectures by external experts, Karim Belabas from Bordeaux, one of the key people behind the leading computer algebra package in number theory, and Juergen Klueners from Kassel, who was visiting Leiden on his Heisenberg stipendium, and a series of Bhargava, Wei Ho (graduate student in Princeton) and Hendrik Lenstra. A total of 25 people participated in this week, including PhD students from Leiden, Groningen and Utrecht.

The second part had 40 participants. The workshop had a very specific focus on the work of Bhargava, which gave rise to a very pleasant and instructive meeting. Due to the set-up the meeting attracted mathematicians of the highest reputations (J.-P. Serre from Paris, B. Gross from Harvard). In addition it was unique in bringing together many of the key players in the subject. About 40 mathematicians participated in talks and discussions. Extended abstracts, relevant papers, one of which originated at the meeting, and relevant letters of P. Deligne (Princeton) can be found at <http://www.math.leidenuniv.nl/%7Ejbrakenh/lowrank/>

S.J. Edixhoven (Leiden University, Netherlands)

H.W. Lenstra (Leiden University, Netherlands)

B. de Smit (Leiden University, Netherlands)

Scientific Report

Predicting Catalysis: from Ammonia Production to the Hydrogen Economy

June 21 – 23, 2006

An important sub-discipline of the field of Chemical Physics is concerned with making predictions for molecule-surface reactions relevant to heterogeneous catalysis, using first principles approaches. This topic is of enormous importance to our every-day life: more than 90% of the chemical manufacturing processes employed throughout the world use heterogeneous catalysts in one form or another. This field has recently seen some remarkable successes. A few years ago, the full step was taken from combined atomistic experimental and theoretical studies to the rational design of an improved supported catalyst, for the steam reforming process (the current commercial process for hydrogen production). In our Research Training Network "Predicting catalysis", it was recently shown that microkinetic theory employing density functional theory to compute reaction rates of elementary steps can now accurately predict the rate of ammonia production over supported ruthenium nano-particles, using the particle-size distribution as the only experimental input parameter. Ammonia production is an important process, which consumes 1% of world energy and is crucial to world food production, ammonia being a raw material for fertiliser.

Heterogeneous catalysis and, more generally, molecule-surface interactions are also of enormous importance to the coming of the hydrogen economy. The relevance of the hydrogen economy needs hardly be stated: if hydrogen can be produced in a clean and efficient manner from sources other than fossil fuels, and if it can be stored and if energy can be extracted from it in an efficient way, this will at once solve the problems of global warming and of limitations on the availability of fossil fuels. The relevance of heterogeneous catalysis is also clear. For efficient operation, fuel cells depend on catalysed electrochemical reactions at the interface of an electrode, one of the issues being that ideally the catalyst is not poisoned by CO that might be present as a trace gas. It has recently been discovered that the solid state chemical reactions through which hydrogen can be stored in and released from alanates (a class of complex metal hydrides) can be catalysed by adding titanium and other compounds. However, the mechanisms through which these compounds catalyse hydrogen storage and release reactions are completely unknown. Potentially, breakthroughs in clean production of hydrogen can be realised through photobiological and photochemical methods, using enzymes (biological catalysts) or catalysed photo-electrolysis. Once again, essential contributions are expected from heterogeneous catalysis.

Recognizing that it was time to bring together scientists who are interested in applying knowledge concerning heterogeneous catalysis (or, more generally, molecule-surface interactions) and scientists performing research at realising the hydrogen economy, a meeting was organised which covered both topics. Experts on heterogeneous catalysis and, more generally, molecule-surface interactions were brought together with experts on production and storage of hydrogen, and generation of energy from hydrogen. These experts consisted of the PIs, post-docs, and other researchers of the network "Predicting catalysis", other surface scientists with complementary expertise, and researchers working on hydrogen. The workshop served as the final symposium of the network already mentioned, and one day was devoted to disseminating what the network had learnt. However, the emphasis was on research for the future hydrogen economy, and the meeting

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also played a part in the setting up of a new Marie-Curie Research Training Network that will perform research on production and storage of hydrogen (Hydrogen, coordinated by Kroes).

The meeting was organised by Prof.dr. G.-J. Kroes, from the Leids Instituut voor Chemisch onderzoek (LIC), Universiteit Leiden, and Prof.dr. J.K. Nørskov, Technical University of Denmark, Lyngby, Denmark. The meeting was held from Wednesday June 21 through Friday June 23, 2006.

Invited speakers were M. Grätzel (Ecole Polytechnique Federale de Lausanne, Switzerland), A. Züttel (University of Fribourg, Switzerland), A.L. Utz (Tufts University, United States), A. Gross (Universität Ulm, Germany), Y. Morikawa (Osaka University, Japan), G.J. Kramer, (Technical University of Eindhoven, The Netherlands), K. Reuter (Fritz-Haber-Institute, Berlin, Germany), B. Hinnemann (Princeton University, US), and M. Neurock (University of Virginia, United States). The highlight of the meeting was the talk by Grätzel, which was also organised as a LIC- and van Marum-colloquium. Grätzel reported that with silicon-doped iron-oxide anodes it had been possible to construct a photo-electrolysis cell which in a tandem cell set-up had shown a solar to chemical conversion efficiency of 4.2 % under AM 1.5 sunlight.

On the Wednesday (sessions on heterogeneous catalysis) and the Friday (sessions on hydrogen), there were also 8 contributed talks. The Thursday was devoted to the research of the network Predicting Catalysis. The highlight of that day was the talk by Karoliina Honkala which summarised the research which had shown that first principles theory can now accurately predict the rate of ammonia production over supported nano-particle catalysts.

Fifty-three participants took part in the workshop, including the organisers. Of these participants, about 30 were from the network, and about 25 were from outside the network (including the invited speakers). Dutch participants came from Leiden University, the Free University of Amsterdam, the Radboud Universiteit Nijmegen, and Shell, Amsterdam. The workshop was sponsored by the EU, the Leiden Institute of Chemistry, and the Lorentz Centre.

G.J. Kroes (Leiden University, Netherlands)

J.K. Nørskov (Technical University of Denmark, Denmark)

Scientific Report

Fine-Tuning Stellar Population Models

June 26 – 30, 2006

Models of the integrated light of stellar populations hold an increasingly important role in the study of galaxy evolution. As telescopes grow bigger, instruments grow more sensitive, and galaxy surveys grow in size and quality, the demand for excellent stellar population models will also grow. Since it is more and more common that results on galaxy evolution are limited by the quality of the stellar population models, rather than the data, it is very important that these models are critically tested, assessed, and further improved.

At the same time, new ingredients for stellar population models are becoming available, such as new stellar spectral libraries, significantly more detailed stellar atmosphere models, and new stellar interior models. A key area of interest for many researchers in this field is the determination of detailed chemical abundances in galaxies to study their nucleosynthesis patterns and consequently their star formation histories. These new model ingredients provide significantly enhanced power to attack this problem, but need to be incorporated in the models, verification, and testing against real observations.

From June 26 to 30, 2006 a technical workshop was held in which stellar population model builders, "ingredient providers" – those researchers providing new stellar libraries and stellar interior and atmosphere models – and model consumers (i.e., observers) congregated to discuss the use and interpretation of current models and their future directions. We had a total of 63 participants, a number close to the maximum that the Lorentz center could accommodate. The number was so high, since many of the world specialists wanted to attend the meeting, and we also wanted to have an equal number of young participants.

The format of the meeting was such that in the morning we had talks of 25 minutes, while the afternoons were reserved for informal discussions. At the end of every day there was a session with short 5 minute talks, which were used by young people, or by more senior staff who had short interesting communications. In the afternoon there were meetings of several sizes covering a lot of very interesting topics. Since many of the participants will also attend the much larger IAU Symposium number 241 in La Palma in December, a number of challenges were developed, where interested researchers are given a number of well-defined datasets, which they can analyse and send in to the organization. At the meeting the different answers will be compared and discussed, with the aim to learn more about strengths and weaknesses of the analysis methods that people are using.

We had 5 sessions:

1. Overview of stellar population models, methods, and uncertainties
2. Resolved and unresolved stellar populations in the low-z Universe
3. Stellar populations of intermediate- and high-z galaxies
4. New ingredients for stellar population models
5. Future models: needs, desires, and feasibilities

The talks of the meeting have been collected and put on the internet. They can be found at <http://www.astro.rug.nl/~sctrager/FTSPM/programme.html>. Almost all the powerpoint presentations appear here. The conference was summarized by Sandy Faber. Her presentation with the highlights of the meeting can be found on the above mentioned website. The summary was very positive, as was the general atmosphere during the

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meeting. It is clear that there is significant progress in the field. Although we are still not able to fully reproduce a galaxy spectrum in great detail, reasonable attempts have recently been made, and model spectra are only getting better. It is also clear that the models that exist are converging on very similar answers for major issues, such as the chemical enrichment of galaxies and their average star formation histories, suggesting that many previous discrepancies are dissolving away.

The meeting went very smoothly. The weather began rather cold and rainy, but from the third day on it was warm and sunny. As a result, the boat trip around Leiden, and the conference barbecue, both on the Wednesday, were a great success. The local organization went very smoothly, and we wish to thank Gerda and Martje for making sure that all the organizational details were taken care of.

Scott Trager (Kapteyn Astronomical Institute, Rijksuniversiteit Groningen, Netherlands)
Reynier Peletier (Kapteyn Astronomical Institute, Rijksuniversiteit Groningen, Netherlands)

Scientific Report

Progress in *Ab Initio* Modelling of Biomolecules: Methods and Applications

July 3 – 7, 2006

Scientific content and motivation

Computer simulation methods based on first principles calculations are increasingly being used to study the structure, dynamics and function of biomolecules. Specifically, the explicit inclusion of the evolving electronic structure (for example by means of Density Functional Theory) in the simulation allows for a proper description of e.g. enzymatic reactions and drugs activity. The primary aim of the workshop was to bring together several researchers active in this field with the double purpose of (i) exchanging the expertise and the progress done in the last few years in dealing with the multi-scale problems encountered in the simulation of macromolecules and bio-systems, and (ii) to envisage strategies for the next future which can increase the effectiveness and scientific impact of this field of research.

While a considerable effort in computational life science is focused on gene sequence and on a mesoscopic description of protein-protein interaction, a detailed microscopic understanding of the activity of biomolecules plays an important role and represents a major scientific and computational challenge. The *ab initio* simulations constitute a crucial tool, complementary to experiments, to elucidate at the atomic level the interplay between microscopic structure and function of a biological system. Such detailed understanding can be a useful ingredient in e.g. drug design, and can have also an impact on optoelectronic, enabling for instance the design of biomolecules with properly tuned optical properties by selective mutations.

In this workshop we discussed methodological developments within *ab initio* simulations and recent efforts to broaden the range of applications to more complex systems. There are a number of technical problems in *ab initio* simulations which are not unique to biological applications but are particularly severe and unavoidable there. (i) A serious limitation is the number of atoms in a simulation, which can only cover the central active region of a protein though longer ranged electrostatic and elastic forces are also important. Therefore a large effort has been devoted recently in the development of hybrid methods which include the protein environment around the active site by using a classical force field approach (QM/MM). Linear scaling methods are also being developed to increase the size of the system treated with *ab initio* methods (ii) The correct calculation of hydrogen bonds and Van der Waals interactions, as well as the correct description of spin states in transition metal complexes present throughout biological systems, are particularly sensitive to the precise choice of correlation and exchange functional in the Density Functional Theory method. We have thus also discussed progress done in improved functionals and the comparison with other *ab initio* many body calculations. (iii) Another issue is the time scale of biological processes that are often very slow compared to the atomic motion so that one has to invoke and compute activated processes through complex pathways. Moreover, biological processes take place at room temperature and therefore it is crucial to calculate efficiently free energy barrier and the lowest free energy reaction path. (iv) A final issue discussed during the workshop is the current state-of-the-art in the calculation of excitation energies and in excited-state molecular dynamics simulations.

Here is a list of the main topics that were discussed during the workshop:

- Drug-DNA interaction
- Photo-activated biological processes

Scientific Report

Structure/functionality changes induced by mutation
Hybrid methods
Linear scaling methods
Excitation energies and excited-state dynamics
Improved exchange-correlation functionals
Metadynamics and Free energy calculation
Transition path sampling
Simulation and interpretation of spectroscopic probes (e.g. NMR chemical shift)

Program and Outcome

The workshop focused on the recent developments in the computational study of structure, dynamics and function of biomolecules. Particular attention was devoted to Density Functional Theory based methods providing an effective and accurate inclusion of the electronic structure in the simulation. The program has been organized in such a way to give ample time to discussions which played a key role. There were a total of 32 participants from Finland, Germany, Italy, The Netherlands, Spain, Switzerland, UK, and USA, all of them playing an active role during the workshop. The workshop has been a stimulating event for all the participants and many young scientists had been given the opportunity to present their research in this international setting either as an oral presentation or in the form of a poster. Poster sessions constituted a useful occasion for informal and fruitful discussions. One of the strategies for the next future which were underlined during this workshop was the need to further develop hybrid methods combining approaches with different degree of accuracy from quantum mechanics to coarse grain simulations. The participants clearly enjoyed the workshop both for the scientific aspects as well as for the excellent facilities provided by the Lorentz Center.

Acknowledgments

This workshop would not have been possible without the financial support of the Lorentz Center and the ESF Psi-k program. The organizers are particularly grateful to Martje Kruk and Wies Groeneboer for their help and assistance.

Francesco Buda (Leiden Institute of Chemistry, Leiden University, The Netherlands)

Paolo Carloni (International School for Advanced Studies, Trieste, Italy)

Ursula Roethlisberger (EPFL, Lausanne, Switzerland)

Scientific Report

Asymptotics: Particles, Processes and Inverse Problems

July 10 – 14, 2006

Introduction

The aim of this workshop was to bring together international experts in various subfields of probability and statistics (indicated in the title of the workshop) to exchange ideas on their research, especially on stochastic processes. Another goal was to bring together these experts and young researchers in the same field in an informal atmosphere.

The Workshop

About 60 people from The Netherlands, the USA, Germany, Austria, France, Switzerland, Belgium, Brazil and the Czech Republic attended the workshop. Among these were about twenty PhD students and junior researchers, mainly (and remarkably many, eight) from Germany and from The Netherlands. Fourteen invited speakers gave presentations on their current research in the field covered by the theme of the workshop. These presentations led to interesting discussions, often continued in the offices available at the Lorentz Center. The junior researchers and PhD students were also invited to present their work, resulting in eight posters. As a consequence of this, many ideas were exchanged between the participants.

Although, initially, the plan was to have a three-day workshop, it was extended to five days, adding two days of more introductory lectures by prominent participants. Most participants extended their stay to also take part in this second, more tutorial part of the workshop.

Outcome of the Workshop

The participants were all enthusiastic about the scientific level of the workshop as well as the open and informal atmosphere sensed during the workshop. Most of the invited speakers agreed to contribute a paper to an issue of the IMS Lecture Notes. The fact that these contributions contain acknowledgements to the participants of the workshop indicates the scientific level and quantity of the discussions that were initiated by the presentations given. The issue of the IMS Lecture Notes is currently in the reviewing stage and we hope it will appear early 2007. All in all, the workshop has stimulated new ideas and collaborations, and it will be remembered by the participants as a fruitful interactive workshop of high scientific level.

Organization and venue

The practical and kind support given by the Lorentz Center staff, especially Stephanie Hessing and Martje Kruk - de Bruin during the workshop was greatly appreciated by all participants, including the organizers. The organizational support given by these people before and after the workshop is also acknowledged gratefully by the organizers.

E.A. Cator (Delft University of Technology, Netherlands)

G. Jongbloed (Vrije Universiteit Amsterdam, Netherlands)

C. Kraaikamp (Delft University of Technology, Netherlands)

H.P. Lopuhaä (Delft University of Technology, Netherlands)

J.A. Wellner (University of Washington, Seattle, USA)

Scientific Report

Membrane Computing

July 17 – 21, 2006

The goal of the seventh Workshop on Membrane Computing was to bring together researchers working in membrane computing and related areas (such as DNA computing, artificial life, computational biology, theory of computation) in a friendly atmosphere enhancing communication and cooperation. This years edition carried the special subtitle 'At the Crossroads of Cell Biology and Computation' to indicate that one specific focus of the meeting was to bring membrane systems back to biology. This was reflected in the invited talks and the discussion sessions following them.

Thanks to the support of the Lorentz Center the organizers could invite seven speakers. Most of their topics were chosen in such a way to reflect the relationships of membrane computing to biology and medicine, and to serve as a faithful illustration of the current state of research.

- * I. Ardelean (Bucharest, Romania) - Biological Roots and Applications of P Systems. Further Suggestions
- * D. Besozzi (Milan, Italy) - Extended P Systems for the Analysis of (Trans)Membrane Proteins Populations
- * M. Camara (Nottingham, UK) - Quorum Sensing: A Cell-Cell Signaling Mechanism Used to Coordinate Behavioral Changes in Bacterial Populations
- * M. Gheorghe (Sheffield, UK) - Population P Systems. A Model for the Behaviour of Systems of Bio-Entities
- * M. Koutny (Newcastle-upon-Tyne, UK) - Synchrony and Asynchrony in Membrane Systems
- * V. Manca (Verona, Italy) - MP Systems Approaches to Biochemical Dynamics: Biological Rhythms and Oscillations
- * M. de J. Pérez-Jiménez, (Sivilla, Spain) - P Systems-Based Modeling of Cellular Signalling Pathways

We are pleased that the workshop was a great success. It was attended by around 50 researchers from 15 countries. The participants ranged from PhD students to well-established researchers in the field, many of which presented their recently developed ideas. Apart from the scheduled lectures there was ample time for interaction and cooperation among the participants. A volume of scientific papers resulting from the meeting and its discussions, but separately refereed, will be published in the Springer lecture notes series.

The organizers are most grateful to the Lorentz Center for its generous support. We would like to thank the Lorentz staff for their help in making the meeting such a success.

Hendrik Jan Hoogeboom (Leiden University, Netherlands),
Gheorghe Paun (Bucharest, Romania & Sevilla, Spain),
Grzegorz Rozenberg (Leiden University, Netherlands)

Scientific Report

Galactic Nuclei

July 24 – 28, 2006

Motivation

This workshop brought together key members of two international research teams: the European "SAURON" team, and the American "NUKER" team; to discuss the latest developments in the field of galaxy nuclei, dynamical modeling of galaxies, and galaxy structure and evolution. In addition, key collaborators of these teams were also invited to broaden the discussion topics, which ranged from black-hole mass scaling relations, to massive galaxy formation in clusters.

This meeting built on the success of a previous workshop in 2004, where the environment of the Lorentz Centre was conducive to constructive interaction between the two teams. This year's workshop complemented this very well, and gave both groups the chance to review the progress since the last meeting.

Attendance

The workshop was well attended, with around 30 participants, including a number of prominent team members on both sides: Roger Davies, Davor Krajnović, Michele Cappellari (Oxford), Eric Emsellem (Lyon) and Glenn van de Ven (Princeton) for SAURON; and Scott Tremaine (Princeton), Sandy Faber (Santa Cruz), John Kormendy (Austin), John Magorrian (Oxford) and Todd Lauer (Tucson) for the NUKERS. In addition, we were joined by Monica Valluri (Chicago), Brian Miller (Gemini), Chung-Pei Ma (Berkeley), as well as a number of associated students and postdocs.

Outcomes

In addition to the enjoyable and informative presentations, the afternoons of the workshop were left free specifically for working groups to tackle key issues regarding the research of the teams and in the general field. Several collaborative projects were started between the teams, including a joint program using the Gemini telescope to study massive black holes in galaxy centers. Sharing of data and cross-checking of results and methods were initiated, and a number of manuscripts in preparation were shared between the groups, triggering feedback and discussion. These interactions have led to several joint observing proposals, and collaboration on papers now in progress.

The generous grant from NOVA of €2500, together with the funding from the Lorentz Center, allowed the organizers to offer accommodation to most participants, and made it possible to host such a diverse group.

Richard McDermid (Leiden University, Netherlands)

Tim de Zeeuw (Leiden University, Netherlands)

Doug Richstone (University of Michigan, USA)

Karl Gebhardt (University of Texas, Austin, USA)

Scientific Report

Gravitational Lensing

July 31 – August 4, 2006

The workshop was held on the occasion of Prof. Roger Blandford's stay in Leiden as Oort professor at the astronomy department. The topic, gravitational lensing, concerns a cosmological effect that has become a versatile tool in astronomy, and in which Blandford has been one of the pioneers.

About 50 participants from around the world took part in the meeting. Acceptance rate of the invitations was very high, well over 50%, and most people stayed for the full week.

The program was rather open: the mornings consisted of two long, didactic, reviews on various aspects of lensing and cosmology, with a few shorter talks on related specialized topics. In the afternoons the participants worked on a set of five assignments, set by the Oort professor on the first day: open questions related to lensing on which we were all encouraged to be as critical as was sensible.

On the final day, the most junior member in each group reported on what had been achieved. The formula proved to be very successful, with two of the groups getting close to completing submittable articles!

R. Blandford (Stanford University, USA)

K.H. Kuijken (Leiden University, Netherlands)

L.V.E. Koopmans (Kapteyn Instituut, Groningen, Netherlands)

Y. Mellier (IAP, Paris, France)

P. Schneider (Argelander-Institut für Astronomie, Bonn, Germany)

Scientific Report

Quantum Criticality

August 7-18, 2006

The focus of this workshop was on the physics of interacting quantum many-particle systems which do not exhibit spontaneous order upon cooling towards zero temperature. "Quantum critical" systems are usually perched at an instability between two ordered quantum phases, but "quantum liquids" without broken symmetries can also occur as stable ground states. Quantum critical matter is characterized by an absence of conventional quasiparticle excitations, and a wide region of the finite-temperature phase diagram develops novel thermodynamic and transport properties that deviate fundamentally from the properties of conventional materials. A growing body of experiments in a wide variety of systems, including highly correlated metals, high-temperature superconductors, quantum magnets and Bose-Einstein fluids, exhibit puzzling phenomena which suggest the importance of quantum criticality.

The workshop's goal was to further deepen our understanding of quantum criticality, focussing on aspects such as the breakdown of Fermi liquid theory in the critical regime, non-equilibrium properties near criticality, and the avenue to novel phases (like unconventional superconductivity) due to instabilities of quantum critical matter. Experimentally, it is important to separate quantum critical behavior from other anomalies arising from disorder or exotic ordering phenomena. On the theoretical front, many basic issues on quantum criticality are still poorly understood, and approaches beyond the standard theory of order parameter fluctuations are apparently needed. Moreover, non-equilibrium and transport behavior in the quantum critical regime is largely unexplored, and likely requires new theoretical tools. In addition, there has been a growing synergy between quantum criticality in ultracold atomic gases on optical lattices, and more conventional electronic systems.

The program of the workshop consisted of several tutorials, regular talks and focussed discussion sessions. The tutorials, on key subjects in the area of Quantum Criticality, were primarily intended to reach out to young researchers (graduate students and post-docs), but were actually enjoyed by most of the workshop participants. The light schedule of regular talks left ample time for discussions. In addition, several topical discussion sessions, e.g., on the current status of metallic quantum criticality (both in theory and experiment), on frustrated magnetism, and on engineering criticality in cold-atom systems, provided a nice platform for the informal exchange of thoughts.

The workshop organizers would like to thank the team of the Lorentz center involved in this workshop, Prof. Wim van Saarloos, Dr. Martje Kruk-de Bruin, and Drs. Stephanie Hessing, for their hospitality and the excellent and efficient organization. The generous financial support through the Lorentz center as well as additional funds from I2CAM (International Institute for Complex Adaptive Matter) and FOM are gratefully acknowledged.

Matthias Vojta (Universität Köln, Germany)

Matthew P.A. Fisher (University of California Santa Barbara, USA)

Qimiao Si (Rice University, Houston, USA)

Kareljan Schoutens (University of Amsterdam, Netherlands)

Scientific Report

Stirring and Mixing: the Lagrangian Approach

21 – 30 August 2006

The workshop formed the completion of an EU network with the same title on fundamental issues in turbulence. In everyday life and in all sorts of industrial processes we rely on the tremendous efficiency with which turbulence mixes contaminants that are added to the flow. The “Lagrangian approach” refers to the situation where one studies mixing while going with the flow. This approach has led to a revolution in turbulence theory that is rooted in highly non-trivial mathematics. We were lucky to have the architects of this new theory in our network.

One of the goals of this workshop was to explain this mathematical revolution in detail to the participants. This was done during 5 “didactical” lectures held during the morning hours of the workshop. Instead of summarizing the state of the field in the usual keynote lectures, the task of this workshop’s didactical lecturers was to explain. Some of these lectures spanned no less than 4 hours, and some exclusively used the blackboard. A new development concerns particles that do not completely go with the flow. For example, in warm turbulent clouds tiny water droplets are flung against each other by the small turbulent eddies such that they may reach the critical mass to become true raindrops. Also this beautiful problem, which reminds of quantum physics, was explained in one of the didactical lectures. The didactical lectures were received very well: finally we were given the opportunity to understand.

The workshop brought together 57 researchers, of which members (20) of the originating EU network formed a minority. We welcomed 13 PhD students; this number could have been larger, but the total number of participants was close to the maximum that can be accommodated by the Lorentz Center. There were 43 research talks, with 30 minutes allotted to senior (post PhD) researchers and 15 minutes to PhD students. In the afternoon breaks (14:00-16:15) several initiatives emerged. One of them was an attempt to define the most pressing problem in turbulence research. After the well-voiced advocacy of its respective proponents, the attendants were invited to vote for several alternatives. It was no surprise that turbulence involving particles (and in the Lagrangian frame) received the most votes.

This workshop saw the birth of a new collaboration on turbulence research which aims at concentration of research efforts that need equipment whose scale and cost transcends the possibilities of individual research groups. This new collaboration will reconvene in december 2006 in Göttingen. The Lorentz workshop was instrumental in laying the groundwork of this new international collaboration. Finally, a start was made with a follow-up European network.

The format of this workshop: the didactical talks, an intense program of lectures with long afternoon breaks was received very well by all participants. All were impressed by the facilities offered by the Lorentz Center and by the professional staff which made the workshop a success.

W. van de Water (Eindhoven University of Technology, Netherlands)

A. Pumir (Institut Non Lineaire de Nice, France)

E. Bodenschatz (MPI, Göttingen, Germany)

Scientific Report

Software for Europe

August 31 – September 2, 2006

Software for Europe is a collaborative research project in the making. It aims at a proposal submitted to the ESF Eurocores-program *Inventing Europe*. In all 11 sub-projects from Europe and the US, participating projects and associated projects, build up the collaboration in Software for Europe. The workshop at the Lorentz Center by the same name, Software for Europe, has been an essential step in the process. Meetings in the spring of 2006 had led to a draft proposal, rewarded by the invitation to prepare a full proposal. This is what happened in Leiden: after the exchange revised texts for sub-projects and themes by mail, the Lorentz Center served as the venue to discuss matters directly. An international telephone conference during the meeting established the connections with those who were unable to attend. The facilities and good atmosphere allowed the desired focus and unity to be reached. Not only was the full proposal delivered in time, it was successful in that it has since been selected and recommended for funding. The workshop was a crucial meeting at a crucial moment in the process towards this success.

Seven participants joined the workshop at the Lorentz Center. Out of the 11 sub-projects, 6 were represented in person; another 4 joined by telephone conference. The main issue at the workshop was to fit together different approaches in the historiography of software, like history of technology, business history, history of science, social history. The issue was tackled basically by contextualising such approaches in the framework of European history and history of the Cold War. Within that context the specifics of a European history of software did appear as significant and coherent.

Here is a summary of the resulting ESF proposal:

Software — the instructions allowing computers to be used — has played a significant and under-explored role in the shaping of postwar Europe. We propose to address this role through the tensions between two contrasting modes of computer technology appropriation: the direct importation of applications software, as promoted by the practices of corporations such as IBM; and the development of software through university-industry co-entrepreneurship, demonstrated in the case of the programming language ALGOL.

Writing a contextual history of software allows us to address historical themes concerning Europe and Europeanness in the second half of the twentieth century. In the initial era of postwar reconstruction, with declined rhetoric setting in across much of Europe, building a computing machine could be seen as a source of specifically national pride; a decade later, the shift from hardware to software initiatives appeared to present a very different, universalist and internationalist character. What informed this change? Underlying software standards, meanwhile, promoted a largely hidden mode of integration: what was its role in the move towards European unification and the Cold War?

As a collaborative research project, building on growing cooperation in European history of computing, Software for Europe aims to answer these questions.

Gerard Albers (University of Amsterdam, the Netherlands)

Scientific Report

Laboratory Cosmology

September 4 – 9, 2006

The study of the formation and evolution of the Universe poses very deep and fundamental questions. However, cosmology is unique among the sciences. We, the observers, are an integral part of the Universe; we cannot rerun the experiment under different conditions to see what happens. We are limited to observing the Universe and trying to formulate theories that may explain our observations.

Despite these difficulties current cosmological theory has been very successful in explaining the present state of the Universe. However, serious problems remain. While the hot big bang model has been universally accepted for decades we are still no wiser as to what caused the big bang. Matter as we know it seems to account for a mere 5% of the contents of the Universe, while the nature of the other 95% (dark matter, dark energy) remains unknown. There is evidence of a period of inflation, an exponential expansion of the early Universe, but we do not know what caused it and why. And we still have no clear understanding of the origin of the asymmetry between matter and antimatter.

Condensed matter physics has many systems whose behaviour and mathematical form mirror, although on a different scale, the behaviour of the Universe as a whole. Superfluids and superconductors have structures of broken symmetry which correspond surprisingly closely to the broken symmetries of the quantum vacuum of the Universe and with behaviour sharing many aspects of the relativistic quantum field theories of particle physics. The same is true for aspects of liquid crystals. State-of-the-art experiments give insights into cosmological phenomena that are otherwise inaccessible to direct testing.

This multidisciplinary research field is usually known as Laboratory Cosmology, and its benefits have been two-way: exciting new ideas have also emerged in condensed matter physics from this interaction, especially a new interest in rapid phase transitions.

This workshop was also the last meeting in a series of six annual conferences co-sponsored by the European Science Foundation as part of their COSLAB Programme, in which we continued to address cosmological problems in condensed matter systems. As before, we concentrated on systems that are accessible to study in the laboratory and able to mimic cosmological behaviour sufficiently closely to throw light on these universal questions. There were fifty-three participants from eighteen countries, with a sizeable fraction of younger participants. The workshop was truly multidisciplinary: it connected experimental and theoretical condensed matter physicists with cosmologists, particle physicists, astrophysicists, field theorists and, for the first time, superstring theorists. It brought the practitioners of the two sides together for extensive discussions --some of them very lively indeed-- and cross-fertilisation.

The last day, September 9th, was dedicated to a special event entitled "30 years of cosmic strings" to commemorate the publication in 1976 of T.W.B. Kibble's paper on his famous defect formation mechanism in rapid phase transitions. Kibble holds the 2007 Lorentz Chair. This paper started the research field of cosmic defects and, would lead, much later, to the birth of Laboratory Cosmology. We are particularly grateful to the Lorentz Center staff and director for making this event possible on a Saturday, and for their excellent support throughout the workshop.

A. Achúcarro (Leiden University, Netherlands)

A.C. Davis (University of Cambridge, UK)

G. Pickett (Lancaster University, UK)

G. Volovik (Helsinki University of Technology, Finland)

Scientific Report

Geometric Patterns in Islamic Art

September 11 – 15, 2006

The aim of the workshop was to bring together people from the sciences, the humanities and the arts who had a professional interest in Islamic geometrical art and its scholarly background. The cooperation between the Leiden department of mathematics, the Freudenthal institute (Utrecht University) and the House of Mathematics in Isfahan formed the basis of the project. The Lorentz workshop was built on the experiences obtained during earlier activities in Isfahan, notably the workshop on geometry and art that was held there in May 2006. While the Isfahan workshop was exclusively intended for mathematicians and architects, the Lorentz workshop of September 2006 focused on bridging the gap between mathematicians, scholars from the humanities and people from the arts. To this end, a conscious effort was made to invite people whose particular activities showed the potential to create fruitful interaction with other disciplines.

As a result, the participants consisted of mathematicians and specialists in various branches of Islamic art history, such as architecture, textiles, and the art of the book, but also architects, designers and painters who made active use of Islamic geometrical design. The substantial delegation from Iran not only included mathematicians and historians of mathematics, but also a specialist of Islamic design who from a long family tradition knew the craftsmanship of geometric design from the inside. A group of selected Iranian students (male and female) already involved in the Isfahan workshop formed part of the delegation. The initial worry of the organizers that participants might split up into disciplines turned out to be unfounded: from the very start there was ample interaction between disciplines, and there was full attendance of lectures and workshops till the very last minute. Several participants said that this type of interdisciplinary meeting was something that fulfilled a long-standing wish, and they were eager to exploit it to the full.

Some immediate results of the workshop may already be mentioned. Luit Mols (Leiden), who had just finished her Ph. D. thesis on Islamic metalwork, realized that there were much wider dimensions to Islamic geometrical design than she had included in her thesis, and decided to apply these new views on the study of Islamic book bindings in the Leiden library. She has since obtained a Scaliger grant to make a start with this work, and is currently working on the bindings of the Islamic manuscript collection. Jay Bonner (Santa Fe, USA), architect and specialist of Islamic geometrical design, now intends to publish a book on this topic which he has prepared with a publisher specializing in mathematics, in order to reach a mathematical readership. Jeanine Daems (mathematician, Leiden) and Gillian Vogelsang-Eastwood (textile specialist, Leiden) have decided to explore the matter of symmetry in textile design. Interest in Iran for their cultural heritage in the form of geometrical decoration has received a considerable boost, and a number of activities in this field have been started up in the wake of the workshop.

M. Bagheri (Encyclopaedia Islamica Foundation, Tehran, Iran)

J. Hogendijk (Leiden University, Netherlands)

R. Kruk (Leiden University, Netherlands)

Scientific Report

Environmental Dispersion Processes

September 18 – 27, 2006

The workshop Environmental Dispersion Processes focused on mathematical models and simulation strategies that are required for predicting the dominant transport mechanisms in the natural environment. This aim was supported by extensive discussion of experimental and field studies. Examples of important environmental transport processes may be found by considering turbulent mixing of (stratified) gases and liquids, of ensembles of small particles or of heat. Such dispersion processes are essential in various situations such as sediment-transport in rivers and coastal areas, spreading of pollutants, dust and soot in urban environments or the heat- and mass-transfer across the ocean-surface, with direct connections to weather and climate predictions.

The emphasis of the workshop was on a fundamental approach to this multi-disciplinary field of research. This requires input and integration from a variety of scientific and engineering disciplines. The many lively and interesting discussions and presentations certainly contributed to realizing this ambition. It helped to strengthen the Platform for Geophysical and Environmental Fluid-mechanics (PGEF) in the Netherlands. Topics from civil and mechanical engineering, mathematical and geophysical modeling, meteorology, hydrology and oceanography were addressed in the presentations.

The workshop provided a platform for the exchange of knowledge and ideas in the field of multiscale modeling and simulation of large-scale problems in environmental fluid mechanics.

FOM and the COST-Action 'LES-AID' supported the workshop financially. This allowed the invitation of a number of international experts who provided detailed presentations of their work. The chosen format of 1-hour presentations allowed in addition ample time for open discussion. During the first week of EDP around 40 people participated, while the final two days attracted around 25 people. Participants came from the Netherlands, Italy, Iran, the United Kingdom, USA, France, Switzerland, Poland and Germany.

The workshop had three focal areas:

- Fundamentals of turbulent dispersion
- Air quality monitoring and prediction
- Transport in rivers, coastal regions and ocean circulation

Next to theoretical and simulation studies, a number of presentations were devoted to experimental and field-studies to help keep a direct connection with environmental aspects. Ample attention was given to the effects of ensembles of particles that are embedded in a flow. Consequences of preferential clustering of inertial particles and inelastic particle-particle interactions were discussed at length.

Bernard J. Geurts (University of Twente, Eindhoven University of Technology, Netherlands)

Scientific Report

Geometric and Multiscale Methods for Geophysical Fluid Dynamics

October 2 – 6, 2006

Motivation

Flows in the atmosphere and ocean exhibit complex multi-scale dynamics that present a challenge both for analytical and numerical methods. To a high degree of approximation, the large scale flows of these systems can be considered inviscid, and the underlying Hamiltonian structure of the equations can be exploited, for example to develop simplified models that retain the structure of conservation laws and symmetries of the full systems. The Hamiltonian approach in analytical modeling was pioneered by Salmon, Holm, Shepherd and developed further by others. Recent times have also seen successes in the use of Hamiltonian methods in the numerical modeling of geophysical fluids.

Nevertheless, the Hamiltonian formulation is incomplete for realistic modeling. Due to the cascade of energy to small scales, the Hamiltonian picture must be supplemented by a parameterization of subscale processes. The influence of internal/gravity waves on large scale motions represents conservative, meso-scale behavior. At the micro-scale, turbulent diffusion must be modeled in a way that respects the balance of energy and does not prohibit upscale cascades. Promising in this regard are stochastic methods. A practical synthesis of these modeling techniques can only be reached through active dialog with scientists from meteorological centers.

This workshop has provided a discussion forum for scientists working on geometric (i.e. variational/Hamiltonian) analytical and numerical methods for geophysical fluid dynamics, scientists working on parameterization of meso-scale (i.e. internal/gravity waves) and micro-scale (i.e. stochastic turbulence) effects, and scientists working on applications in meteorology and climate simulations.

At present, we are approaching a conflux of these research areas, where one can begin to envision a new breed of prediction tools, in which Hamiltonian-based large scale dynamics, with excellent energy balance, correct reduced dynamics in asymptotic parameter regimes, and superior statistical spectra, are coupled to advanced parameterization models of meso-scale wave effects and micro-scale stochastic turbulence.

The workshop

In total, 26 participants from Ireland, France, the U.S.A., the U.K., Germany, Australia and the Netherlands attended 21 presentations spread out over the workshop week and established collaborations during the various time slots dedicated to discussion and interaction. Several participants expressed that this format of presentations, sufficient time for collaboration and shared office space provided a stimulating environment for new research ideas.

Furthermore, the five participating Ph.D. students, two of whom presented their work, established an informal network among themselves. They felt that meeting the authors of papers they have read enlivened the science and lowered thresholds to contact the authors. All participants established new research ideas and strengthened existing contacts.

No effort was made to schedule the talks according to topic, and this worked well. The variety of presentations concerned meteorological applications, numerical Hamiltonian

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geometric methods, gravity-wave interactions, and stochastic modeling of unresolved processes. The research atmosphere was challenging due to the critical audience but simultaneously friendly, constructive and conducive to collaborations.

Two social events took place: an informal conference dinner at the Poort van Leyden with excellent food, scientific discussions and good company on Wednesday evening; and, an interesting guided tour in the Old Observatory in the old centre of Leiden where three telescopes were visited. The somewhat derelict state of the Observatory as a place of historic and scientific significance was a concern to us.

This Lorentz Center workshop continued a tradition of informal interactive workshops on geometric and multiscale methods in geophysical fluid dynamics originally begun in the U.K. around 2002, continued in Germany in 2005 and now in The Netherlands. Plans for a next workshop in Bremen and then again in The Netherlands were forged.

The support of the staff of the Lorentz Centre was much appreciated: the institute was kept operational during Leids Ontzet, and even interesting weather was arranged, including a lightning show on Sunday evening and intermittent showers and sunshine during the week. The workshop was supported through funds of NWO, the J.M. Burgers Centrum Research School for Fluid Mechanics, NDNS, and CWI (Amsterdam).

Onno Bokhove (University of Twente, Netherlands)

Jason Frank (CWI, Amsterdam, Netherlands)

Scientific Report

2nd UNAWE Multidisciplinary Workshop

October 9 – 13, 2006

Motivation

This workshop formed an integral part of the development of the Universe Awareness project.

Universe Awareness (UNAWE) is an international programme that will expose underprivileged children between ages 4 and 10 to inspirational aspects of astronomy, with minimum goals of introducing them to the vastness and beauty of the Universe. The programme will use the beautiful images of the Universe obtained with the latest telescopes and will include the historical and indigenous aspects of astronomy in each culture to build on its human dimension.

The goal of the workshop was to engage in the development phase of Universe Awareness, just like the first workshop in May 2005 in Garching, Germany initiated the preparation phase.

Attendance

Between October 9 and 13, 2006, around fifty people from nineteen countries on five continents came to Leiden. Professions represented covered the fields of Astronomy, Outreach, Education and Learning, International Development and Anthropology with representatives from the academic world as well as professionals. The diversity in both professional and geographical background of the participants stimulated thorough and fertile discussions and a variety of presentations.

The first day was marked by the visit of the Minister of Education, Culture and Science, during which she announced funding for the International Development Office of UNAWE for 2007 – 2010.

Outcomes

During the workshop many interesting talks were given and various aspects of this development were discussed thoroughly in working groups. Each day was centred around a theme as follows:

- Oct. 9: Introduction to UNAWE
- Oct. 10: Science and Belief Systems
- Oct. 11: Educational Environments
- Oct. 12: Child Development and Organisation
- Oct. 13: Programme Organisation and Implementation

A series of concrete recommendations were reached at the end of each day. A long report being written as a UNAWE Development working document. The purpose of this report is to collect the findings of the workshop and to set achievable goals to aim for in the next phase of the development of UNAWE.

Universe Awareness is going to be implemented in a number of countries as an outcome of the workshop. Among those are Colombia, India, Italy and the United Kingdom. The

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workshop also enabled participants working already on UNAWE in their country to develop contacts, exchange ideas and experiences with people from other countries.

Finally the UNAWE International Network for Astronomy Outreach and Education was launched at the workshop.

The workshop was sponsored by ESO and the Lorentz Center. This allowed participants from emerging countries to travel to the Netherlands and take part in this fruitful workshop.

George Miley (Leiden University, Netherlands)

Claus Madsen (ESO, Germany)

Carolina Ödman (Leiden University, Netherlands)

Cecilia Scorza (Heidelberg University, Germany)

Scientific Report

Fuel Cell Catalysis – A Surface Science Approach

October 16 – 20, 2006

The workshop was held at the Lorentz Center of Leiden University from October 16-20, 2006, and organized by M.T.M.Koper (Leiden), A.Wieckowski (Illinois) and J.K.Nørskov (Lyngby). It brought together some 70 scientists from Europe, United States of America, Japan, China, South Korea and Israel. The workshop received sponsorship from Leiden University, the Foundation for Fundamental Research on Matter (FOM), the Netherlands Organization for Scientific Research (NWO), Delft Institute for Sustainable Energy (DIDE), the Royal Netherlands Academy for Arts and Sciences (KNAW), and the International Society of Electrochemistry (ISE), and co-sponsorship from Toyota, Johnson-Matthey, Umicore, Energy Research Center of the Netherlands (ECN), and CMR Fuel Cells.

The workshop brought together experimentalists and theoreticians working in the field of fundamental fuel cell catalysis, to discuss and identify major research themes in the "surface science approach" to catalytic reactions at the solid-liquid interface relevant to fuel cells. Emphasis was on a molecular-level description of fuel catalysis for low-temperature polymer electrolyte membrane (PEM) fuel cells, both hydrogen-oxygen fuel cells and direct alcohol fuel cells, based on well-defined systems probed with state-of-the-art experimental and theoretical tools. Catalysis issues included CO tolerance of both anode and cathode (in relation to methanol crossover), oxygen reduction, and alcohol oxidation. The workshop reviewed progress and outlined future challenges in the application of surface-sensitive techniques [vibrational spectroscopy (IR, Raman, non-linear, laser), scanning tunneling microscopy, X-Ray scattering, NMR, electrochemical techniques, etc.] and modern computational techniques (DFT, ab initio MD, kinetic Monte Carlo simulations), and in particular their combination, in understanding the molecular basis of fuel cell catalysis. Important topics were: trends in reactivity and structure sensitivity, nanoparticles, "dynamic" catalysis (surface diffusion, catalyst restructuring), combining experiment and theory, comparison electrocatalysis-gas phase catalysis, models and simulations of elementary reaction steps, new experimental techniques, "non-traditional" catalysts such as non-platinum-based surfaces and enzymes.

A prominent conclusion from the workshop was the field of electrocatalysis for fuel cells has matured immensely in the past few years and the cooperation between theory, experiment, and surface science has contributed significantly to this important progress. We are entering a period in which we obtain a molecular-level understanding of fuel cell catalysis, which may ultimately contribute to improved fuel cell performance. Improved simulation methods to study elementary reactions, the experimental ability to work with and at well-defined nanoparticles, and the use of bio-inspired or bio-mimicking catalysts were recognized as important avenues for the future.

M.T.M. Koper (Leiden University, Netherlands)

A. Wieckowski (University of Illinois, USA)

J.K. Nørskov (Technical University of Denmark, Denmark)

Scientific Report

From Brown Dwarfs to Planets: Chemistry and Cloud Formation

October 24 – 27, 2006

The study of brown dwarfs and extrasolar planets constitutes a very active field of astrophysical research. Knowledge on their physical structure and chemical composition is gained from the interpretation of complex spectra using a handful of sophisticated numerical codes. Those codes share the basic physics but do not treat the critical influence of the cloud formation on the atmospheric structure in the same way which maybe partly due to their different origins: low-mass stars at the one hand, and planetary atmospheres on the other hand.

The aim of this workshop was to invite theoreticians, observers, and experimentalists to discuss the physio-chemical processes of cloud formation in brown dwarfs and in planets and to compare different model approaches as input for standard model atmospheres which are used to fit observations. Furthermore, we aimed on and succeeded in involving cross-scientific aspects by inviting scientists working in meteorology and engineering. Each of the invited review speakers supported the workshop idea with excitement. The backbone of the workshop was two-fold: the review part and the workshop part.

The review part contained 2 review talks per day on observational results on brown dwarfs and solar system cloud formation, laboratory studies, and theoretical approaches to cloud formation. The link to everyday's experiences was provided by a talk on opacity modeling of Earth clouds. Each morning session was followed by ample time for discussion. All the talks were loaded with information towards the aim of the workshop and carefully aimed on the broad expertise of the audience, only the talk on solar system cloud appeared a bit narrow.

The actual comparison of model results on dust clouds was made during the afternoons. Test cases had been calculated by those participants (and one remote) actively involved in dust cloud modeling in brown dwarfs. Most of the codes are also used to study exo-planetary atmospheres. The data has been collected and prepared before the workshop started. The comparison showed some similarities and the strong differences amongst the models. After the need for a break, which was used to view posters, a vivid discussion on the dust cloud modeling arose challenging every modeler to provide details on his/her own model ideas. Beside the unique opportunity of gaining understanding in other model approaches, the understanding and recognition of the differences among the cloud model approaches was felt particularly important by the participating observers and lab people.

Participants had settled in 4 working groups to discuss various details of dust cloud formation at the beginning of the workshop. However, the need to reach a respective level of agreement between the different modeler parties brought participants back to a general discussion.

Summarizing, the workshop brought together participants from The Netherlands (4), Germany (8), Denmark (1), France (3), India (1), UK (3), and the US (8) who are working on modeling of substellar and cool star atmospheres, observations of substellar objects and dust forming systems, instrumentation, meteorology, engineering, astrophysical laboratory experiments. The workshop offered a public lecture on exoplanets which was given by Uffe

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G. Jørgensen (Niels Bohr Institute Copenhagen) and Ben Oppenheimer (AMNH, New York) volunteered to give one of the "Lorentz Center Highlight" talks. Frans Rietmeijer presented, in addition to his review talk, the newest results of the STARDUST mission.

Achievements of the workshops are an increased transparency amongst the modelers and towards observers and experimentalists. The opportunity to discuss cross science was highly valued. It was furthermore discussed what physics and chemistry need to be modeled to describe cloud formation in brown dwarfs and planets, and which laboratory data are missing. Here again, input from other sciences like meteorology was highly valued. The outcome of the workshop is planned to be published in a refereed paper.

The workshop would not have been possible without the financial and organizational support of the Lorentz center and in particular by Martje Kruk and Wies Groeneboer. The friendly and competent work of the Lorentz Center staff is gratefully acknowledged by the participants and the organizers. The workshop received additional financial support from NOWA, KNAW, and SUPA (Scottish University Physics Alliance). ESA/ESTEC kindly printed the workshop posters and sponsored the public lecture speaker.

M. Fridlund (ESA, Noordwijk, Netherlands)

Ch. Helling (University of St. Andrews, UK)

T. Guillot (OCA, Nice, France)

P. Hauschildt (Hamburger Sternwarte, Germany)

M.S. Marley (NASA, Moffett Field, USA)

D. Stam (Netherlands Institute for Space Research, Utrecht, Netherlands)

H. Rauer (Berlin, Germany)

Scientific Report

Games, Action and Social Software

October 30 – November 3, 2006

The Netherlands Institute for Advanced Study in the Humanities and Social Sciences (NIAS) has hosted a theme group under the title *Games, Action and Social Software* in the period from 1 September 2006 until 31 January 2007. In this project, we have focused on the cognitive, logical, computational and strategic aspects of social mechanisms, bringing together creative researchers from philosophy, logic, computer science, cognitive science and economics in order to arrive at an interdisciplinary perspective, and help create an active community with a more definite agenda.

Supported by the Lorentz Centre, NIAS and the NWO Cognition Programme, the workshop *Games, Action and Social Software* took place at the Lorentz Centre on October 30- November 3, 2006. The focus was on computer science, in particular on multi-agent systems.

Rohit Parikh, one of the invited speakers at the workshop, has introduced the term *Social soft-ware* in the late nineties for the research program that combines logic, game theory and computer science techniques in order to design and analyze social interaction and social procedures. Examples are procedures for voting and fair division, as well as communication procedures that ensure that some classified information becomes known only within a certain group. Thus far the cognitive viewpoint has not played an explicit role in research on social software, while we believe that it may be profitably used to enhance social procedures.

Typical topics for lectures at the workshop were:

- Definitions of social software from different viewpoints;
- Procedures by which one could determine the intersection of the FBI's list of sought-after potential terrorists and KLM's list of passengers of a certain flight, without either party having to divulge its own list;
- Procedures for fair division and negotiation;
- The evolution of cooperation from a computational and economic viewpoint.

The days were structured by two longer lectures at the beginning and end of each day and two or three shorter ones in between.

An hour was scheduled each afternoon after lunch, in order to create ample time for structured discussion. We have structured these discussion sessions in advance by creating groups of around eight researchers each, on the themes *Social software: what is it?*, *Protocol analysis*, *Battle of the logics* and *The role of logic in game theory*. On the last morning each group shared their results in a plenary session. As an immediate result of these fruitful discussions at the Lorentz workshop, a book of lighthearted but serious discourses is in progress, edited by Van Eijck and Verbrugge, to be submitted to the series *Games, Logic and Computation*, Amsterdam University Press.

We are pleased to report that the workshop has been a great success. More than 40 participants from the Netherlands and abroad took part, of which a sizable number were junior researchers, for example Ph.D. students from the Marie Curie Research Training Site

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GloriClass connected to the ILLC in Amsterdam and from the graduate schools SIKS, IPA, and OzsL.

The relaxed atmosphere and the unique facilities at the Lorentz Centre fostered lively discussions, which sometimes went on into the late evening. Several new collaborations were started, some of which have already borne fruit in contributed articles in the book of scientific papers in progress *Games, Actions and Social Software*, edited by Van Eijck and Verbrugge, provisionally accepted by Elsevier as well as the book of discourses mentioned above. We have received extremely positive feedback from many of the participants.

Further details of the workshop can be found at:

<http://www.lc.leidenuniv.nl/lc/web/2006/235/descript2>

Rineke Verbrugge (University of Groningen, Netherlands)

Jan van Eijck (CWI, Amsterdam, Netherlands)

Scientific Report

Dissecting the Milky Way

November 6 – 10, 2006

Our own Milky Way is the only galaxy which -- with foreseeable technology -- we can explore in 3 spatial dimensions, and even all 6 phase-space dimensions; and we can do so on a star-by-star basis. Such a detailed dissection of the Milky Way holds enormous potential for understanding its formation history, the stellar populations and the dark matter content. As the quintessential 'case study', the Milky Way as a cosmological testing ground provides a much needed complement and counterpoint to the extensive surveys of the galaxy population as a whole.

A set of ongoing projects, such as RAVE and SEGUE, are providing an order of magnitude leap -- by quality and quantity -- of the data on which such Milky Way studies can be based: multi-colour photometry, astrometry, radial velocities and spectral/chemical diagnostics. Taken by themselves, these projects hold enormous scientific promise; yet they are also stepping stones on the way to ESA's cornerstone mission GAIA. At the same time, such leaps in data quality need to be accompanied by extensive theoretical and modelling developments, to apply the data optimally to answer the astrophysically most interesting questions.

With many observational surveys underway and with GAIA 5 years down the road, the timing was ideal for this workshop. The extensive and very impressive emergent results from the SDSS (and SEGUE) were discussed, as well as the very first results from RAVE and from a number of smaller projects on the Milky Way and M31 were presented. New puzzles from the properties of the dwarf galaxies populations, as well as the large amount of substructure in the stellar halos of these two large disk galaxies were some of the highlights. The theoretical and modelling efforts were also discussed, and it became clear that these aspects need to be strengthened and developed in the coming years for the proper scientific exploitation of GAIA. Thanks to the participation of some of the world leaders from the "Milky Way community", to the combination of experienced researchers and young postdocs and graduate students, and to the high-quality of the presentations, we believe the workshop has begun to chart the path towards linking observations to the "big questions" in near-field cosmology in the years to come.

The format of the workshop worked very well, discussions during the talks and in the offices were very lively. We already know of a sizeable number of projects of collaborations that were started there and are now being pursued actively.

We thank the Lorentz Center for its hospitality, and the staff (in particular, Stephanie Hensing) for the invaluable help in making this workshop a great success.

Hans-Walter Rix (Max Planck Institute for Astronomy, Heidelberg, Germany)
Amina Helmi (Groningen University, Netherlands)

Scientific Report

Studies of Infrared Selected Galaxies

November 13 – 17, 2006

The workshop brought together 20 scientists from Europe and the USA to discuss the evolution of galaxies from $z=4$ to $z=1$. This is the critical redshift interval in which galaxies are assembled. The focus of the workshop was on the study of mass selected samples, to analyse the build-up of mass of galaxies with time. An important aspect was the comparison with theoretical models.

The theoretical models are improving significantly, and we are now in a position to make more detailed comparisons between theory and observations.

The workshop was a great success, with presentations, and many lively discussions. Half the time was filled with presentations, the other half consisted of discussions, often in small groups, and work at the computer.

The facilities of the Lorentz Center are unique in many ways: with the large number of rooms, everybody can work behind a desk in peace and quiet, and at the same time, have discussions with others if she/he prefers. The common-room is a focus point where discussions arise spontaneously.

Overall, many papers were discussed or planned during the meeting, and many new projects initiated. These included a study of the correlation function of red galaxies at high redshift from the very deep UDS survey, and the study of galaxy morphologies as a function of mass and star formation. The latter project is led by Toft, who is preparing a paper for publication in the *Astrophysical Journal*.

The meeting was exceptionally fruitful, and it is a pleasure to thank the Lorentz Center for the excellent support and financial contribution to the workshop.

M. Franx (Leiden University, Netherlands)

Scientific Report

Astro-Wise Preparing for Surveys

November 20 – 23, 2006

Introduction

In 2007 the OmegaCAM panoramic imager will start observations on the ESO VLT Survey Telescope at Paranal, Chile. AstroWise is the European consortium funded by the FP program of the European Union and coordinated by OmegaCEN in Groningen. Astro-Wise provides the innovative software and hardware to run and analyze several large survey projects. Each large survey project will produce Terabytes of data on which complex analysis has to be performed to meet the science goals. The main goals of this workshop were (i) get the surveys ready for operations, (ii) present the new developments within the Astro-WISE Information system (iii) evaluate the testing of the Astro-WISE system performed by consortium partners and (iv) set up a plan for the future of the Astro-WISE consortium.

The Workshop

Thirty-eight participants joined the workshop from institutes all over Europe and in Chile. The Monday was devoted to discussion of the new developments within the Astro-WISE system. Each partner reported on its developments in the morning and presented example applications in the afternoon session. On Tuesday morning the new advanced analysis tools in Astro-WISE were discussed: the photometric redshift tool, the two variability tools and the surface photometry analysis tools. Tuesday afternoon was set aside for a plenary discussion of the evaluation results of the Astro-WISE system for each partner. Prior to the workshop different partners had calibrated an identical set of data. Wednesday was devoted to discussion of the operational plans for the surveys. Dutch astronomy is a partner in all these surveys. The KIDS and OMEGATRANS surveys gave detailed overviews of their operational plans. Furthermore, it became clear that Astro-WISE partners are planning to use Astro-WISE also for surveys which are not related to OmegaCAM at the VST: for example Pan-Starrs (MPE). Various splinter meetings were held on Wednesday afternoon in which specialized topics were discussed by the experts on these topics from each Astro-WISE partner. The principal investigators for the Astro-WISE project held a meeting in which the current status of the project was evaluated and a plan was developed for the future operations of the Astro-WISE consortium.

On Thursday morning, the KIDS survey team met for an internal overall discussion of their survey. The KIDS team will perform one of the largest surveys with OmegaCAM. This completed the Astro-WISE workshop. All workshop presentations are available at: <http://www.astro-wise.org/agendanov06.shtml> .

We would like to emphasize that the series of office spaces and meeting rooms available in the Lorentz Center proved to be perfect for this workshop. Issues which emerged during the plenary presentations during the day could be discussed in detail among interested participants in an office later on. The easy computer and internet access ensured that relevant information for the discussion was at the participants' fingertips. Furthermore the overall informal atmosphere at the Lorentz Center, with its own coffee room and personal offices promotes a fruitful exchange of ideas between the participants from all over the globe. Having such an informal workshop in addition to the regular telecons of the Astro-WISE consortium is crucial to make good progress on both the Astro-WISE system development and the astronomical science being performed with it.

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Conclusions

The workshop was a success in several respects. Both novice and advanced users of the Astro-WISE system were happy with the offered program. The goals of the workshop, as listed in the Introduction, were achieved. The Astro-WISE environment was finalized and delivered to the European Union on December 1, 2006. Survey teams are now ready for operations with OmegaCAM using Astro-WISE. Thus the Astro-WISE partners hope that OmegaCAM will start its operations as soon as possible in 2007.

A successful workshop has been achieved thanks to the generosity, infrastructure and outstanding organization of the Lorentz Center and of the people working there. The workshop organizers express their special thanks to dr. Martje Kruk and Gerda Filippo for their help prior to and during the workshop.

Edwin Valentijn (Kapteyn Institute, Groningen, Netherlands)

Gijs Verdoes Kleijn (Kapteyn Institute, Groningen, Netherlands)

Erik Deul (Leiden Observatory, Leiden, Netherlands)

Scientific Report

Perspectives on Scientific Practice from Science and the Science Studies

November 27 – Friday 1, 2006

Goals and Themes

The goals of this wide-ranging workshop were to bring together natural scientists and scholars in the science studies—philosophy, history, and social studies of science—to discuss the practice of the natural sciences under four headings:

- Objectivity: how concepts of objectivity are formulated and evolve in scientific debate and how scientific knowledge, despite its origin in local and contingent processes, can attain objective validity (three talks);
- Credibility: how trust in scientists' findings is created, maintained, and sometimes damaged, both within the scientific community and in broader society (five talks);
- Communication: how public engagement with scientific findings can be nurtured, for example through the work of science museums and museums of the history of science (four talks and one public lecture);
- Autonomy: what the relations are between the branches of the natural sciences, with particular reference to the problem of reduction (four talks).

The workshop constituted also the inaugural event of the new programme of collaboration between the Lorentz Center and the Netherlands Institute for Advanced Study in the Humanities and Social Sciences (NIAS), Wassenaar, to foster interdisciplinary research involving diverse scientific and academic disciplines. This programme of collaboration was announced during the official opening of the workshop, and the conceptual grounds of the collaboration were the object of a session on "Interaction between Natural Sciences, Social Sciences and Humanities" (three talks).

Realization

We were successful in attracting prominent scholars in the science studies and natural scientists as speakers. All the talks were appropriately designed and achieved the stated aims. The discussion periods were constructive and lively, and the discussion extended into the plentiful coffee, lunch, and tea breaks. The goal of fostering interaction between natural scientists on the one hand and philosophers, historians, and scholars in the social studies of science on the other hand was largely achieved. Of the speakers at the workshop, 11 are based in the Netherlands, 5 in the United States, 2 in the United Kingdom, and 1 in Denmark. The workshop attracted 55 registered participants.

The workshop included two outreach elements. The first was a lecture by Dr. David Healy (Cardiff University), "Does Anything in Psychiatry Work? The Implications for Neuroscience if the Answer Is No", in "This Week's Discoveries", an open lunchtime colloquium at the Faculty of Mathematics and Natural Sciences. The second was a public lecture by Professor John Durant (Director, MIT Museum), "Public Engagement with Research: The Real Challenge for the 21st Century". This lecture was held at the Kamerlingh Onnesgebouw in the centre of Leiden and was followed by discussion with the audience. Both Dr. Healy and Professor Durant were also among the speakers at the workshop.

The proceedings continued informally during a very enjoyable boat trip and workshop dinner.

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The workshop received advance coverage in Hilje Papma, "The Science Wars Are Over", Leiden University *Nieuwsbrief*, 14 November 2006 (<http://www.nieuwsbrief.leidenuniv.nl/061114.html>).

The workshop organizers are very grateful to the Lorentz Center team that supported this workshop, especially Dr. Martje Kruk-de Bruin, Dr. Henriette Jensenius, and Ms. Stephanie Hessing. The organizers received support and advice also from Professor Wim van Saarloos, Director of the Lorentz Center, and Professor Wim Blockmans, Rector of the NIAS. Lastly, we are grateful to all the financial sponsors of the Lorentz Center that made it possible to organize this workshop.

Dirk van Delft (Leiden University and Museum Boerhaave, Netherlands)

James W. McAllister (Leiden University, Netherlands)

Rob Visser (Leiden University and Utrecht University, Netherlands)

Scientific Report

Molecular databases for Herschel, ALMA and SOFIA

December 6 – 8, 2006

It was the objective of this workshop to bring together members of the communities in spectroscopy, quantum chemistry, and submm astronomy, to review the status and contents of the validated spectroscopic data bases and discuss the next steps and set priorities (molecules and isotopes) for laboratory work.

The motivation for this workshop was that unambiguous identification of observed molecular spectral lines is very critical for the scientific success of any spectroscopic FIR/Submm mission or facility. ALMA, Herschel and SOFIA will for the first time open up the FIR/Submm spectral range with unrivalled sensitivity and spectral resolution resulting in a quantum leap in number of detected spectral lines. With the launch of the Herschel Space Observatory scheduled for 2008 and first science observations with ALMA starting in 2009, it was therefore considered urgent to create a reliable database of FIR/Submm molecular spectral lines, readily accessible for the community.

More than 55 scientists from 10 countries (North America, Europe, Asia) participated in this workshop. The workshop provided indeed a forum where the capabilities of the web-based access tools were presented, the activities of the different groups active in these areas were presented and further requirements were discussed.

The discussions resulted into an assessment of the most critical areas that need to be addressed.

While some of these topics are experiencing a spectacular advance, i.e. collisional rates, others, like molecular databases, are strongly limited by the reduced experienced man power available to feed and maintain these public catalogues (CDMS and JPL). In addition, we have identified the main molecular species that will pollute the millimeter, submillimeter and far-infrared spectra of most astronomical sources.

A detailed list of priorities is being worked out and a white paper is being prepared to be presented to the funding agencies and sponsoring projects.

J.C. Cernicharo (DAMIR, IEM-CSIC, Madrid, Spain)

E. Caux (CESR-CNRS/UPS, Toulouse, France)

Th. de Graauw (Leiden Observatory/SRON, Groningen, Netherlands)

X. Tielens (NASA Ames Research Center, Moffett Field, USA)

Scientific Report

Dispersion Forces and Nano-Electro-Mechanical Systems

December 11 – 15, 2006

The workshop focused on the role of dispersion forces derived from quantum electrodynamics (QED) and their effects on nanoelectromechanical devices and related physical systems. The participants included theorists, experimentalists, computational physicists, material scientists, and engineers. The goal was to connect people who work in the field of surface force measurements in general with people who work only on QED forces, such as the Casimir and van der Waals forces, and to further their understanding of the influence of these forces in micro/nano electromechanical systems (MEMS/NEMS). Physicists, engineers, chemists, and material scientists working in this field often face a common challenge – to deal with and benefit from the influence of natural or artificial surface roughness, temperature effects, and finite conductivity on the interaction mechanisms between surfaces at short separations. Despite common problems, researchers are often unaware of progress beyond their narrow area of expertise. Our workshop represents a pioneering attempt to stimulate multidisciplinary discussion around these topics. Our proposition derived from exploiting progress in surface force measurements on the one hand, and on the other in fabrication down to nanometer-length scales of device structures that incorporate mechanical motion and that may be designed to perform a variety of functions in optical, electrical, and, in particular, mechanical and mixed domain applications. The workshop format was advantageous for our purposes. We gave plenty of time for researchers from different fields to get acquainted with each other and to initiate discussions and collaborations. The topics for discussions included the following major issues:

- Influence of plate surface roughness, temperature, finite conductivity, surface plasmons, and electromagnetic properties on the Casimir-van der Waals interaction.
- Effects from changes of conduction properties (from metal to insulator), and effects of boundary geometry on Casimir forces
- Influence of dispersion forces on pull-in/out characteristics in capacitive MEMS/NEMS, and stiction-adhesion problems.
- Micromechanics and measurements at nanoscale.

This was an open workshop where we specifically encouraged participation by junior scientists (graduate students and postdocs) to present a poster or a short talk related to the workshop topic. The number of participants was 50.

From the talks and discussions various focus points and conclusions were drawn:

- From the theory point computing the Casimir Force between bodies with complex geometry requires new theoretical approaches that go beyond the additivity assumption.
- Van der Waals and Casimir forces can be influenced by finite temperature effects under non-equilibrium conditions and further experimental measurements are necessary in this direction. Measurements of the temperature effect in the Casimir-Polder force have been presented by groups that study the interaction between a Bose-Einstein condensate and a dielectric plate.
- It is essential that scientists work together for a proper comparison of the Lifshitz theory with high accuracy experiments. This comparison requires, for example, careful characterization of the optical properties and of the surface roughness of the materials used in the experiments

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- Comparisons of experiments and theory at 1% level (reported in literature) have been analyzed and contested by some groups
- New techniques for the measurement of the Casimir and Casimir-Polder forces have been presented. These includes: the use of dynamic AFM and of large resonator (in both plane-plane and cylinder-plane geometry) for the measurement of the Casimir force, and the use of high resolution nuclear spin echo experiments and Bose Einstein condensates for the measurement of the Casimir-Polder force
- New dispersion forces in liquid systems were presented in terms of hydrophobicity with origin still under investigation
- In the field of nanotechnology, there is a considerable interest in manipulating the Casimir force (both in magnitude and sign) playing with geometry and material structure. The benefit one can possibly achieve experimentally depends on properties like microscopic surface roughness, finite conductivity, material temperature and optical properties
- The influence of surface plasmons on the Casimir force in negative reflection material (metamaterials) surfaces (in the visible regime) requires further investigation.

Our participants found the workshop very successful and the Lorentz Center a great place to perform a workshop where a warm and positive atmosphere inspired further discussions and future collaborations. The help from the LC staff was excellent and we are very grateful for their support.

We also like to thank our sponsors for their financial support:

Lorentz Center

Koninklijke Nederlandse Akademie van Wetenschappen (KNAW)

MESA+ Institute for Nanotechnology

Materials Science Center (MSC)

Netherlands Institute for Metals Research (NIMR)

Attocube systems

Veeco

ST Instruments

Lumera laser

G. Palasantzas (University of Groningen, Netherlands)

D. Iannuzzi (Vrije Universiteit, Amsterdam, Netherlands)

A.A. Maradudin (University of California, Irvine, California, USA)

V.B. Svetovoy (University of Twente, Enschede, Netherlands)

Scientific Report

Gossip-based Computer Networking

December 18 – 22, 2006

The goal of this workshop was to bring together the major players in a well-known, but reviving field of distributed computer systems, known as gossip-based networks. These type of distributed systems are characterized by the way information is disseminated among a huge collection of computing nodes. Periodically, each node simply contacts one of its randomly chosen (current) neighbors to exchange new information. The effect of this combination of randomness, periodicity, and information exchange is rapid spreading of data akin to the epidemic behavior of diseases.

Despite the simplicity of the basic principles underlying gossip-based systems, the behavior that emerges from applying these principles is not well understood at all. For example, it is often very difficult to predict the effects that small changes in the exchange protocol may have with respect to the dissemination speed and topological distribution of data. Another group of questions relate to the application of gossiping techniques in wireless environments, which make it, for example, impossible to communicate directly with any other computing node.

The aim of the workshop was to identify a number of important areas for further research, and to formulate positions concerning next steps to be taken. Areas that have been identified are applications, application development support, security, probabilistic modeling, theoretical frameworks, gossiping in wireless environments, gossip-based storage, and controlling emergent behavior.

Quite unusual for workshops in Computer Science, we had limited the number of presentations and instead provided ample opportunity for discussions. To this end, each of the 50 participants joined one or two working groups to prepare a position. Each group reported back twice during the week, and set out an agenda for writing a position paper to be published in ACM's Operating System Review. The presentations were given by renowned scientists in the field and fueled many discussions on questions fundamental to gossiping in distributed computer systems. This combination of strong, often provocative talks, discussions, and working groups formed an excellent basis for gaining further insight into this remarkably complex field. The form of the workshop was highly appreciated by all participants, and already turned it into a successful event.

The professional organization and the facilities provided by the Lorentz Center were excellent and very much appreciated by all participants. They definitely contributed a lot to the success of the workshop.

Anne-Marie Kermarrec (INRIA, Rennes, France)
Maarten van Steen (VU, Amsterdam, Netherlands)

Subsidie van de minister van OC&W voor het Lorentz Center

18 april 2006

De minister van Onderwijs, Cultuur en Wetenschap kent 1,8 miljoen euro subsidie toe aan het Lorentz Center van de Universiteit Leiden. Het Lorentz Center brengt topwetenschappers in de exacte wetenschappen samen in internationale, intensieve workshops. Deze formule, naar Amerikaans voorbeeld, is uniek in Europa. De subsidie van OCW maakt het mogelijk de succesvolle Lorentz Center-formule uit te breiden naar meer onderzoeksterreinen, zoals de life sciences.



Prof. dr. Wim van Saarloos, directeur van het Lorentz Center: 'Nu kunnen we onze activiteiten op internationaal competitief niveau gaan financieren'

"Een erkenning voor jarenlang vasthouden aan waar je in gelooft", zo karakteriseert Wim van Saarloos, hoogleraar theoretische natuurkunde en directeur van het Lorentz Center, de subsidie van het ministerie. We hebben het Center kunnen opstarten dankzij de onderzoeksorganisaties NWO en FOM die ons jarenlang door dik en dun gesteund hebben. De Universiteit Leiden stelt zeer genereus de volledige infrastructuur en staf ter beschikking en NWO en FOM dragen, ook voor de komende jaren, een basissubsidie voor de kosten van de workshops bij. Met de middelen van het ministerie zal het, nu na acht jaar, mogelijk worden om onze activiteiten op internationaal competitief niveau te gaan financieren. Daardoor kunnen we de komende jaren meer coryfeeën naar Nederland halen, wereldwijd oproepen plaatsen om belangrijke wetenschappelijke workshops in Nederland te organiseren en bovendien ons concept uitbreiden naar vakgebieden buiten de traditionele bètadisciplines".

Bij workshops van het Lorentz Center worden vooraanstaande onderzoekers in een bepaald vakgebied voor een of twee weken samengebracht om heel intensief samen te werken. Tijdens zo'n periode werken onderzoekers samen aan nieuwe theorieën, bespreken ze nieuwe meetresultaten of bediscussiëren ze nieuwe trends in het onderzoek. Het Lorentz Center begeleidt de onderzoekers in het organiseren van een succesvolle bijeenkomst, neemt ze alle administratieve rompslomp uit handen en zorgt voor een informele, stimulerende omgeving. Zo krijgt iedere onderzoeker gedurende de workshop een eigen kantoor met alle nodige voorzieningen.

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Het Lorentz Center, in 1997 door drie hoogleraren opgericht naar Amerikaans voorbeeld, is uitgegroeid tot een internationaal wetenschappelijk centrum. Lorentz Center workshops worden door Nederlandse onderzoekers erkend als waardevol voor de zichtbaarheid en inbedding van de Nederlandse bètawetenschappen op wereldschaal. Ook is het een goede plek voor jonge onderzoekers om 'gezien' te worden. Met de door het Lorentz Center gekozen niche (workshops van 1 tot 3 weken en een eigen werkplek voor alle gasten) speelt het centrum in op de huidige tijd: onderzoekers hebben steeds minder tijd voor reflectie. Een paar maanden sabbatical is vaak niet mogelijk vanwege onderwijs- of bestuurlijke verplichtingen of de persoonlijke situatie thuis. Dankzij het samenbrengen van de meeste relevante onderzoekers op het Lorentz Center raken de deelnemers in korte tijd up-to-date in hun vakgebied, ontstaan nieuwe samenwerkingsverbanden en worden nieuwe onderzoekstrategieën geformuleerd - en dat terwijl contact met het thuisinstituut mogelijk blijft dankzij de eigen werkplek op het Lorentz Center.

Press Releases

Bewustwording heelal brengt kinderen verder

27 september 2006

Astronomen, onderwijsdeskundigen en antropologen komen van 9 tot 13 oktober bijeen in het Lorentz Center (Leiden) in een workshop "Universe Awareness". Universe Awareness (UNAWE) is een nieuw internationaal programma, dat gericht is op economisch benadeelde kinderen tussen 4 en 10 jaar in ontwikkelingslanden en in Europa. Men wil kinderen bewust maken van de schoonheid van het heelal. Ook minister Maria van der Hoeven (Onderwijs, Cultuur en Wetenschap) zal deelnemen aan deze workshop en hem officieel openen, ter gelegenheid van haar bezoek aan het Lorentz Center.

De initiatiefnemers hopen dat jonge kinderen een gevoel voor de omvang en schoonheid van het universum krijgen door bewustwording van het heelal. Dat verbreedt hun blik en stimuleert de ontwikkeling van hun wereldbeschouwing. Hun voorstellingsvermogen zal worden gestimuleerd door spelletjes, avonturenfilms en liedjes.

Het programma maakt kinderen bewust van de zon, het planetenstelsel, sterren en sterrenstelsels. Als ze zich de maat van de aarde realiseren, zullen ze een beter begrip krijgen voor de kwetsbaarheid van hun omgeving. Enthousiasme, avontuur en verbazing zullen kinderen daarbij stimuleren.

De visie op het heelal is cultureel en soms ook religieus bepaald. Elke beschaving heeft naar de hemel gekeken, op zoek naar antwoorden op zijn diepste vragen. Er zijn rijke tradities vol mythes en legendes die daarvan getuigen. UNAWE wil juist op dit punt uitwisseling stimuleren. Dat is deze dagen extra actueel nu wereldwijd de Ramadan is begonnen, een periode die begint en eindigt met astronomische waarnemingen van de maan. Schoolklassen uit sterk verschillende culturen kunnen een partnerschap aangaan en zo respect voor elkaars geloof en opvattingen leren. Zo laat het programma zien dat kinderen deel uitmaken van een gevarieerde menselijke familie.



Tijdens de workshop is dit een belangrijk onderwerp. Er wordt gediscussieerd over de verschillende visies op astronomie en manieren om conflicten met traditionele opvattingen te vermijden. Er is aandacht voor rationeel denken in verschillende geloofsopvattingen en het vergaren van kennis over traditionele sterrenkunde op verschillende plekken op aarde.

Veel aandacht tijdens de workshop gaat ook naar de uiteenlopende didactische omgevingen. Het programma krijgt te maken met de basale omgeving zoals die op het platteland van ontwikkelingslanden veel voorkomt, zonder ervaren leraren en zonder technische hulpmiddelen. Tegelijk doen kinderen mee uit een geavanceerde omgeving, waar ze al jong naar school gaan, waar ze kunnen omgaan met internet en waar ze worden begeleid door ervaren leraren.

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Het ontwikkelen van educatief materiaal is één van de onderwerpen van de workshop. Pilotprojecten in Venezuela en Tunesië hebben laten zien dat het belangrijk is dat dit materiaal ter plekke wordt ontwikkeld. UNAWE kiest een bottom-up benadering, zodat aangesloten kan worden bij de lokale behoeften en opvattingen. Nederland is één van de deelnemende landen die onderwijsmateriaal zal ontwikkelen. De deelnemers aan de workshop spreken met elkaar over het benaderen van die verschillende groepen, de didactische technieken en materialen en de manier

waarop leraren bij het programma kunnen worden betrokken

Verder is er tijdens de workshop veel aandacht voor de organisatie rond UNAWE. UNAWE is officieel aangekondigd op de algemene vergadering van de Internationale Astronomische Unie IAU, deze zomer in Praag. De workshop in Leiden is de tweede UNAWE workshop. Naast het Lorentz Centrum draagt ook het European Southern Observatory bij aan de organisatie. Een week lang zullen astronomen, specialisten in wetenschapscommunicatie, onderwijsdeskundigen, ontwikkelingswerkers en leraren uit een groot aantal landen met elkaar discussiëren en werken aan het UNAWE programma.

Minister Maria van der Hoeven (Onderwijs, Cultuur en Wetenschap) zal de workshop op 9 oktober bezoeken, als onderdeel van een rondgang door het Lorentz Center. Zij zal van gedachten wisselen met de directeur van het Lorentz Center Prof. Wim van Saarloos, met KNAW-hoogleraar George Miley, initiatiefnemer van UNAWE en enkele leraren en betrokkenen. De minister brengt ook een bezoek aan de workshop 'Verandering', die gelijktijdig in het Lorentz Centrum plaats vindt. Het project Verandering is gericht op intensivering van natuuronderwijs op de Nederlandse basisschool, door middel van leskisten en een actuele webomgeving. De leskisten bieden duurzaam lesmateriaal over sterrenkunde, biologie, aardwetenschappen en meteorologie.

De aankondiging en organisatorische details staan op:

<http://www.lorentzcenter.nl/lc/web/2006/211/info.php3?wsid=211>

Het programma van de UNAWE workshop is te vinden op:

http://www.universeawareness.org/index.php?page=workshops&ws=leiden_10_2006

Algemene informatie over UNAWE is te vinden op: <http://www.universeawareness.org>

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Betere brandstofcellen voor duurzame energievoorziening

16 oktober 2006

Chemici, materiaalkundigen en energie-experts komen van 16 tot 20 oktober bijeen in het Lorentz Center (Leiden) in een workshop over brandstofcellen. Brandstofcellen maken elektriciteit uit waterstof of een andere brandstof en zuurstof uit de lucht. Die techniek biedt perspectief op schoner energiegebruik. Experimentatoren en theoretici bediscussiëren tijdens de workshop de wisselwerking tussen brandstoffen en de actieve stoffen die in een brandstofcel zitten, de zogeheten katalysatoren. Processen die zich afspelen aan het oppervlak van deze katalysatoren zijn cruciaal voor het functioneren van de brandstofcel. Nauwkeurig inzicht in deze processen maakt het mogelijk om brandstofcellen te verbeteren.

Brandstofcellen zijn belangrijk voor de toekomst van ons transport. Ze maken het mogelijk om andere brandstoffen te gebruiken dan alleen olieproducten. Er zijn niet alleen brandstofcellen voor waterstof, maar bijvoorbeeld ook voor alcohol. Met de elektriciteit die de brandstofcel daaruit maakt kan bijvoorbeeld een elektromotor worden aangedreven. Brandstofcellen maken dus elektrische auto's mogelijk zonder dat daarvoor omvangrijke en zware accu's nodig zijn of een verbrandingsmotor die schadelijke stikstofoxiden produceert. Waterstof kun je veel makkelijker opslaan dan elektriciteit. Het is bovendien erg schoon. Het kan gemaakt worden uit water, waarvan voldoende voorradig is. Het water komt weer vrij in de brandstofcel, schoon water is het enige dat uit de uitlaatpijp komt. Dat maakt waterstof een ideale energiedrager voor transport, zonder de vervuilende bijwerkingen van de brandstoffen die we nu gebruiken. Op de lange duur biedt waterstof perspectief op echt duurzaam transport.

Ook andere brandstoffen voor brandstofcellen maken schoon transport mogelijk. Alcohol kan gemaakt worden uit gekweekte gewassen en levert daardoor geen bijdrage aan het broeikas-effect. Brandstofcellen gebaseerd op alcoholen zijn ook een goed alternatief voor accu's in elektronische apparatuur. Ze gaan langer mee dan de huidige accu's en hoeven niet opgeladen te worden. Je hoeft alleen maar een nieuwe alcoholcartridge in je laptop of je mobieltje te doen.

De prijs van brandstofcellen is nu nog hoog. Een deel van de hoge prijs wordt veroorzaakt doordat er platina nodig is voor de katalysatoren in een brandstofcel. Het is een wetenschappelijke uitdaging om katalysatoren te ontwerpen met minder of geen platina. Het gebruik van andere materialen is daarom een belangrijk onderwerp op de workshop. Ook de gevoeligheid voor vervuiling krijgt aandacht. Een kleine concentratie koolmonoxide in de brandstof kan de brandstofcel ernstig aantasten. Meer inzicht in de processen aan het oppervlak van de gebruikte katalysatormaterialen kan leiden tot brandstofcellen die toleranter zijn voor koolmonoxide, efficiënter werken en goedkoper zijn om te produceren.

Tijdens de workshop is er veel aandacht voor nieuwe technieken om gedetailleerd te besturen welke processen zich afspelen aan de oppervlakte van de gebruikte materialen. Het gaat daarbij om waarneemtechnieken (bijvoorbeeld vibrationele spectroscopie, STM, X-Ray scattering, NMR) en ook om computersimulaties (met quantummechanica, moleculaire dynamica en kinetische Monte-Carlo simulaties). De deelnemers zullen discussiëren over de rol van nano-deeltjes en de dynamische katalyse, waarbij de bewegingen over het oppervlak en structuurveranderingen belangrijk zijn.

Nieuwe perspectieven bieden ook biologische katalysatoren, naar voorbeeld van processen in ons lichaam. Eén van de ideeën is om elektriciteit op te wekken uit glucose aan de hand van

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enzymatische processen. Als dat lukt, kunnen kleine elektrische apparaatjes in het lichaam worden gebracht, die hun energie halen uit de suikers die in het bloed aanwezig zijn.

Behalve door het Lorentz Center wordt de workshop gesponsord door NWO, het Delft Instituut voor Duurzame Energie (DIDE) en de International Society for Electrochemistry (ISE).

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Speltheoretici over verkiezingen en passagierslijsten

30 oktober 2006

Speltheoretici, economen en informatici komen van 30 oktober tot 3 november bijeen in het Lorentz Center (Leiden) in een workshop over speltheorie en sociale software. Ze bediscussiëren onder meer betrouwbare technieken om inzage te geven in passagierslijsten en eerlijke stemprocedures bij verkiezingen.

Speltheorie bestudeert beslissingsprocessen, waarbij verschillende partijen betrokken zijn. Het gaat bijvoorbeeld over onderhandelingen tussen staten, strijdende echtgenoten of concurrerende bedrijven. Speltheorie ontwikkelt procedures die in dat soort situaties behulpzaam zijn. Een klassiek voorbeeld is "kiezen of delen". Wie een pizza in twee stukken verdeelt, kiest als laatste zijn eigen helft uit. Eigenbelang garandeert dan dat iedereen een even groot stuk krijgt. Het blijkt verrassend complex om dit soort procedures te veralgemeniseren voor bijvoorbeeld het verdelen van erfenissen of het verdelen van de boedel bij echtscheidingen.

Rohit Parikh zal hierop tijdens de workshop ingaan. Hij vond de term "sociale software" in 2002 uit en bracht daarmee verschillende vakgebieden bij elkaar. Economen, logici, wiskundigen en informatici bestuderen samen welke rol een computer kan krijgen bij het uitvoeren van eerlijke procedures. Hij bestudeerde ook procedures voor verkiezingen. De wiskundige studie van stemprocedures begon al in de achttiende eeuw. Sindsdien is er veel kennis vergaard over de voor- en nadelen van verschillende kiesprocedures en de mogelijkheden om stembusfraude te voorkomen, ook bij gebruik van stemmachines.

Tijdens de workshop spreekt ook Wouter Teepe (Rijksuniversiteit Groningen). Hij ontwierp een procedure waarmee een luchtvaartmaatschappij aan een inlichtingendienst inzage kan geven in een passagierslijst, zonder dat de twee instanties bij elkaar in de computer hoeven te kijken. Via cryptografische technieken wordt gegarandeerd dat de inlichtingendienst alleen de namen te zien krijgt die op zowel de passagierslijst als op de verdachtenlijst staan. De namen van alle andere passagiers blijven geheim in deze procedure. Het is dus niet nodig een inbreuk te doen op de privacy voor het voorkomen van aanslagen.

Ook spreekt Steven Brams (New York University). Hij patenteerde een procedure voor boedelverdeling bij echtscheidingen die de laatste tijd veel gebruikt wordt in de VS. Hij zal spreken over dit soort verdelingsproblemen. Een andere opvallende spreker is Dov Samet (Tel Aviv University), een belangrijke grondlegger van de speltheorie. Hij heeft onder meer procedures bedacht voor "agreeing to disagree".

Tijdens de workshop zal er veel ruimte zijn voor de betrokkenen uit de verschillende vakgebieden om ideeën met elkaar uit te wisselen en nieuwe onderzoekslijnen op te zetten. De workshop is onderdeel van een half jaar durend onderzoeksprogramma op het Netherlands Institute for Advanced Study in the Humanities and Social Sciences.

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Alfa's, Beta's en Gamma's dichten onderlinge kloof

Gezamenlijk persbericht van Lorentz Center en NIAS, Leiden en Wassenaar,
9 november 2006

Een breed gezelschap natuurwetenschappers, wetenschapshistorici, -filosofen en -sociologen komt van 27 november tot 1 december bijeen in het Lorentz Center (Leiden) voor een workshop over hun onderlinge verhoudingen. Centraal op deze multidisciplinaire bijeenkomst staat de confrontatie van uiteenlopende zienswijzen van alfa's, bèta's en gamma's op de praktijk van het natuurwetenschappelijk onderzoek. De workshop 'Perspectives on Scientific Practice from Science and the Science Studies' markeert de officiële start van een samenwerking tussen het Lorentz Center en het NIAS, het Netherlands Institute for Advanced Study.

De verhoudingen tussen bèta's die aan het front van natuurwetenschappelijk onderzoek opereren en alfa's en gamma's die deze laboratoriumarbeid tot onderwerp van hun science studies maken, laten te wensen over. De wijze waarop wetenschapsstudies de resultaten van laboratoriumonderzoek interpreteerden en de methodes van bèta's door een eigen bril in ogenschouw namen, wekte 'in het andere kamp' de nodige wrevel. Van de jaren negentig dateren de Science Wars, waarin over en weer harde woorden vielen.

Inmiddels is de tijd rijp voor herstel van de verhoudingen, voor reflectie en samenwerking. Op de workshop van het Lorentz Center zullen beoefenaars van wetenschap en wetenschapsstudies met elkaar in debat gaan om zo tot een vruchtbare ideeënuitswisseling te komen. Iedere dag van de workshop heeft een eigen thema: objectiviteit, geloofwaardigheid, interacties tussen natuurwetenschappen, sociale wetenschappen en humaniora, communicatie en autonomie.

Tot de sprekers op de workshop behoren vooraanstaande wetenschappers uit binnen- en buitenland. Vertegenwoordigers van de onderzoekspraktijk zijn de Britse prozac-onderzoeker David Healy, de astronoom Vincent Icke en de fysicus Frans Saris. Van buiten het laboratorium komen wetenschapshistoricus Jim Bennett (directeur van het Science Museum in Oxford), de wetenschapsfilosofe Noretta Koertge (Indiana University) en de Amsterdamse filosoof Hans Radder.

Naast het programma in het Lorentz Center is er op donderdag 30 november in het Kamerlingh Onnes Gebouw (de huidige locatie van de Faculteit Rechten, aan de Steenschuur in Leiden) een publiekslezing. John Durant, directeur van het MIT Museum in Cambridge (VS) en autoriteit op het gebied van Public Understanding of Science, zal spreken over 'Public Engagement with Research: the Real Challenge for the 21st Century'. Aanvang 17.00 uur. Na afloop discussie & borrel. De workshop 'Perspectives on Scientific Practice from Science and the Science Studies' wordt van 27 november tot 1 december 2006 gehouden in het Lorentz Centrum in Leiden. Geïnteresseerden kunnen de lezingen en discussies kosteloos bijwonen. Inlichtingen en inschrijving: Stephanie Hensing, hensing@lorentzcenter.nl (e-mail address hidden) , Tel: 071 5275431. Zie ook www.lc.leidenuniv.nl/lc/web/2006/219/info.php3?wsid=219.

Over het Lorentz Center:

In de workshops van het Lorentz Center werken vooraanstaande bètawetenschappers uit binnen- en buitenland een week samen aan actuele wetenschappelijke problemen. Informele discussie en interactie staan centraal. Deze intensieve kennisuitwisseling levert vaak een grote vooruitgang op. Zie <http://www.lc.leidenuniv.nl>.

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Over het NIAS:

Op het NIAS (Netherlands Institute for Advanced Study), een instituut van de KNAW gevestigd in Wassenaar, verblijven jaarlijks enkele tientallen fellows uit de wereld van de humaniora en de sociale wetenschappen. Individueel dan wel in het verband van een themagroep werken ze aan een project van grotere omvang, bijvoorbeeld een boek. Zie <http://www.nias.knaw.nl>

Samenwerking Lorentz Center - NIAS:

Sinds kort werken het Lorentz Center en het NIAS samen in multidisciplinaire projecten. Zo stelt het NIAS in overleg met het Lorentz Center ook enkele Lorentz Fellows aan die zich specifiek bezighouden met onderwerpen die raakvlakken vertonen met zowel de exacte wetenschappen, de sociale wetenschappen als de humaniora. In dit brede kader van alfa, bèta en gamma programmeert het Lorentz Center jaarlijks enkele workshops. Met de workshop 'Perspectives on Scientific Practice from Science and the Science Studies' gaat deze nieuwe vorm van samenwerking op 27 november officieel van start.