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// Appendix to the Annual Report

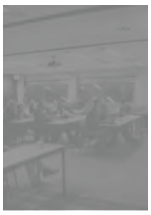
2016 January - June





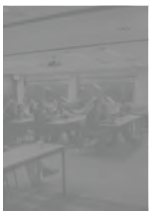


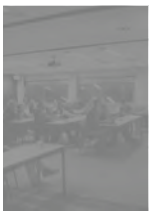


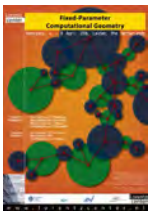


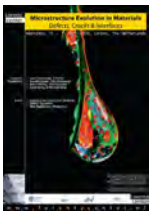




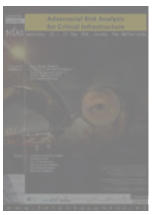


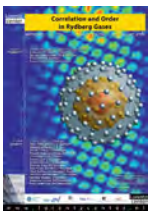


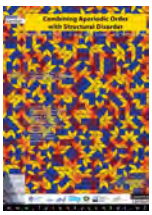


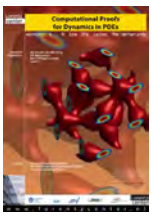




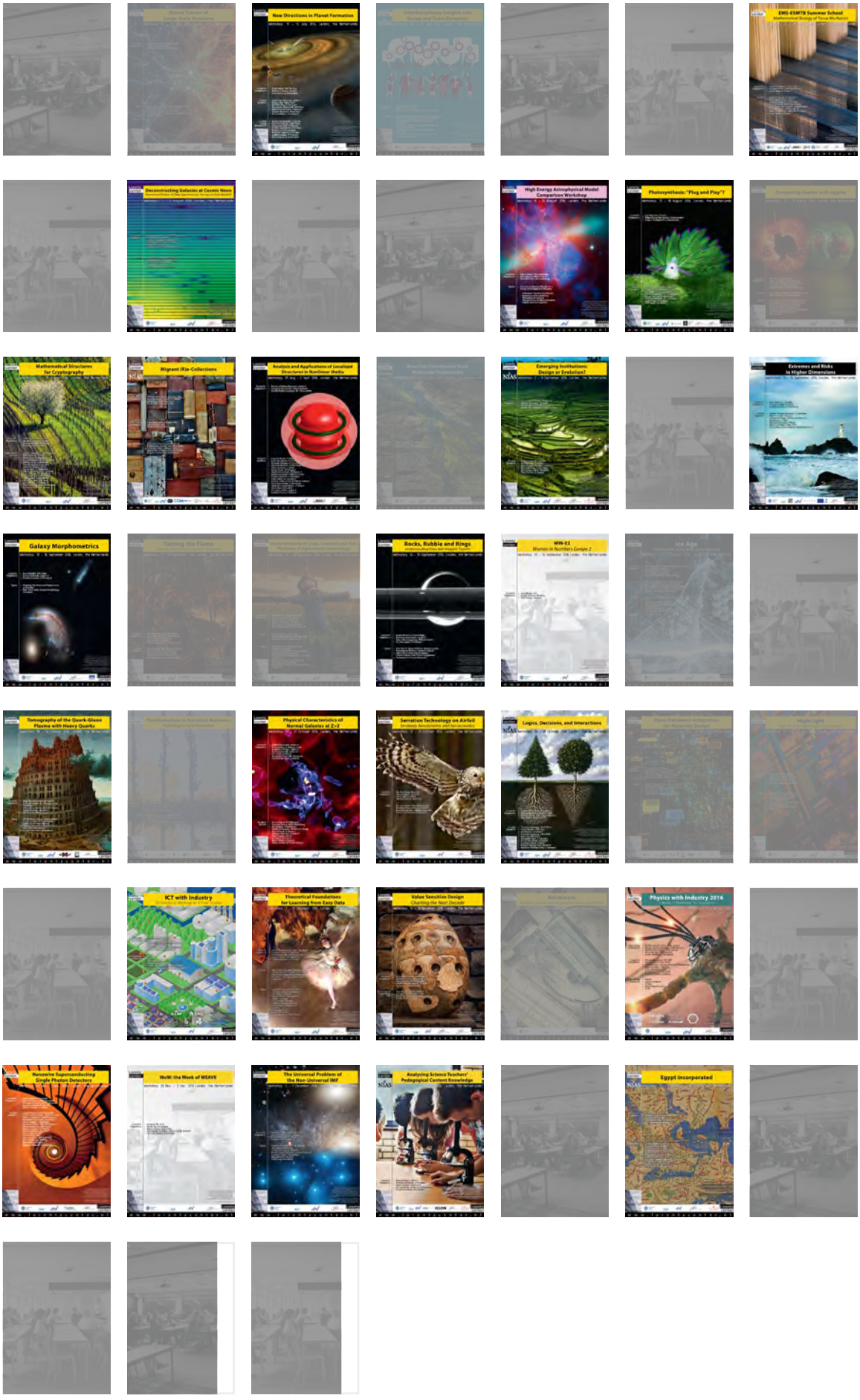




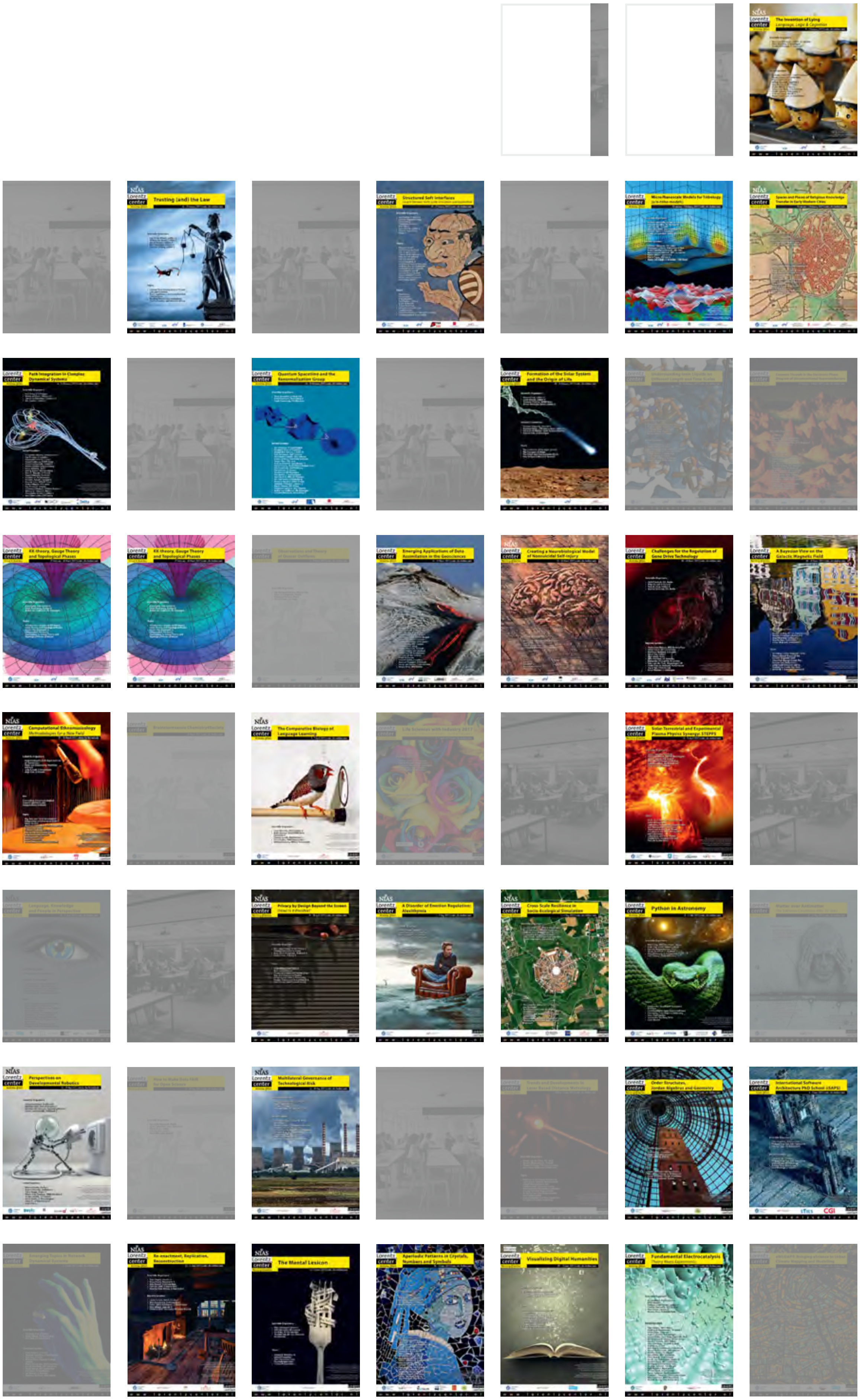




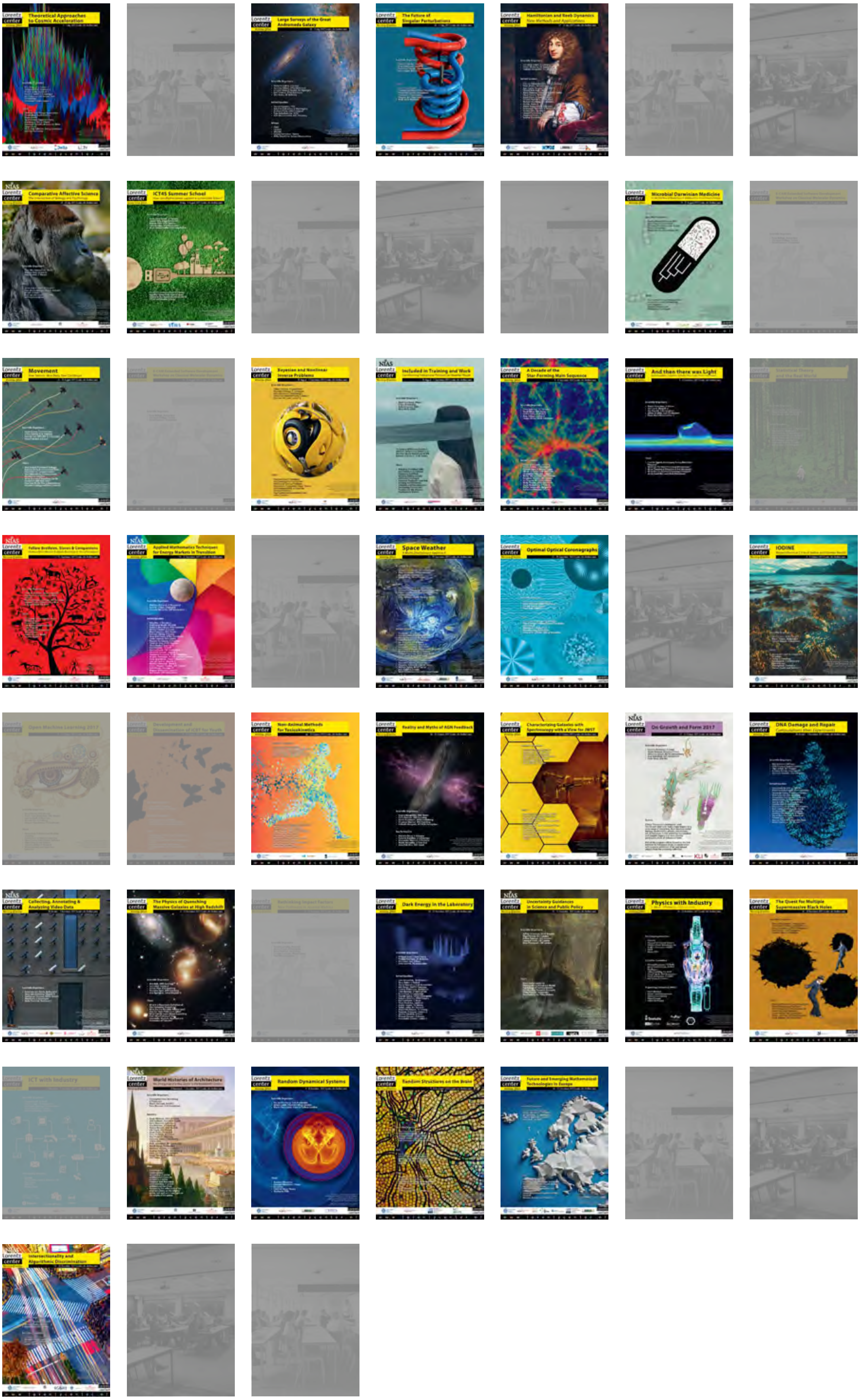

July - December **2016**



2017 January - June



July - December **2017**



CONTENTS

Translational Aging Research

Challenges and Opportunities

6 - 8 January 2016 @Oort

Aim

The Lorentz workshop brought clinicians, epidemiologists, basic scientists and computational scientists together to focus on the translational potential of knowledge created in the field of ageing research. Although it became clear that research in elderly people to improve care, biomedical research to improve the health span, and basic science to unravel molecular and cellular ageing mechanisms are different scientific communities the aim of the meeting was to find innovative ways to improve communication and to seek common research questions. Moreover, we aimed to describe how the instruments and tools in model systems can be placed at the service of Population and Patient-based studies to deliver true translational research: the end result should be applicable in the clinic, in prevention, diagnosis or treatment.

Outcome

Clinicians and biologists are equally focused on finding drivers and markers of biological ageing. The main conclusion of the workshop was that to improve translational potential of the ageing field clinical researchers and basic scientists should jointly establish pipelines of connected research strategies focused on functional systems such as the musculoskeletal or neurocardiovasular system. Crucial for this is that navigators should be trained that connect clinical and basic research within these pipelines. Based on state-of-the-art knowledge, the field needs to prioritize the most informative and functional biomarker sets that indicate physiological ageing in human systems. This is vital to monitor health improvement in response to for instance interventions. Research in animal models should maximize the comparability of phenotypes and related pathways to match those relevant in human ageing. At the same time, animal-based studies into molecular mechanisms of ageing potentially reveal hubs in vital and conserved regulatory systems and will thus contribute to novel targets for intervention. This is important as drugs are often developed for their effect on surrogate endpoints, but due to the pleiotropic effects of treatment, drugs frequently fail to improve the clinical endpoint or even adversely affect health. The better the molecular networks of ageing humans are understood, assisted by animal research, the better the surrogate endpoints can be chosen.

Improve communication

For The Netherlands the conclusions of the Lorentz workshop will be presented at the kick-off meeting of the Dutch Society for Research on Ageing (DuSRA) that has recently been founded in 2015. Again at that meeting the focus is on how to connect clinical and basic research. Also as a consequence of the Lorentz meeting we approached the Clinical Society for Internal Medicine to become formally connected to the DuSRA to secure that joint meetings will be organized and that mutually beneficial research agenda's will be drafted.

Stimulate Healthy Ageing

A decline in function is detectable from the thirties onward in humans but with the gain of knowledge there are increasing opportunities to intervene. The decline is a highly heterogeneous process, not

linear, and includes metabolic shifts at different points in the lifetime and stochastic changes that diversify the phenotypes of ageing individuals. To understand the driving forces behind this variation research is needed from stem cell and genetic research through to the role of lifestyle and nutrition. All these research lines encompass the aim and potential to deliver molecular targets and to lifestyle and nutritional interventions to stimulate healthy ageing. The Lorentz concept worked very stimulating as indicated by the enthusiastic responses of participants. After many working group discussions systems pipeline concepts began to emerge demonstrating that joint efforts between clinical research and basic science to design such pipelines is vital to book any translational progress. The format of the Lorentz meeting helped us clarify how to bring working groups together in the near future. This awareness is timely; at the DuSRA kick off meeting also the scientific director of the National Institutes of Ageing (NIA) USA will indicate how the NIA has made attempts to bring the right parties together for translational research strategies. The Dutch Ageing research community is now primed to improve the situation in The Netherlands and to jointly approach policy makers and funding agencies to help setting our targets and work on the pipelines we will define.

A summary of the Lorentz meeting is being finalized both from the scientific and public perspectives created by members of the organizing committee and journalist Rebecca Miler, respectively.

Gerald de Haan (Groningen, The Netherlands)
André Uitterlinden (Rotterdam, The Netherlands)
Eline Slagboom (Leiden, The Netherlands)
Bas Zwaan (Wageningen, The Netherlands)

Perspectives on Diversity

The Cultural Life of Absence

10 - 13 January 2016 @Snellius

In Western culture the notion of disability is often considered as the absence of "something". It is socially seen as negative: the entire body or mind as the whole minus the impairment. The impairment is often only described as a loss. In the past, the notion of disability often had strong connotations with authenticity, or the fact that a mentally ill, deaf or blind person would be pure and innocent - as if a full access to all the senses would imply corruption. Conversely, disabled people were often considered as overemphasizing the use of the other senses which caused social tensions. Ever since the early-modern culture, impairment has carried the connotation of loss, absence or the lack of psychological determination and the need for patience.

The workshop was a first step in exploring the social life of absence, stressing the dialogue between disability and society in the past and the present. It addressed explicitly the view of society and the perspectives of the side-lined groups who aim to create a new definition of self, the group and the 'handicap'. The aim was to create an international and interdisciplinary network to start an interdisciplinary dialogue between scholars and interest groups.

The workshop was preceded by a public event in the Boerhaave Museum, in which plenary talks on the social life of absence (by prof dr. Douwe Draaisma, writer and performer Vincent Bijlo and performer Jascha Blume) were combined with experiences related to disabilities (a session presenting the work of guide dogs for the blind and guided tours for people with hearing and visual impairments) and discussion on the life of 'absence' with people from different interest groups (survey and discussion). The points raised during the discussion were also addressed in the three-day workshop.

The workshop consisted of a number of sessions directed at diverse topics and of various activities including presentations but the focus was on debate and exchange.

Day one addressed the history of disability, connecting arts, history, social sciences, and experiences of disability in the public domain (and multimedia). More particularly, the focus was on issues such as the often negative representation of sensory and physical disabilities in philosophy and art since Antiquity, and on the sometimes polemic (self-)representation of people on the autistic spectrum in education and the media.

Day two was centred on disability and impairment in language and literature. The two overarching issues that were addressed were the visibility of the deviations from the standard and the acceptance of the existence of non-normative language/literacy.

The third day investigated the human animal-robot nexus. It primarily focused on the opportunities and challenges which the use of animals and machines may present for disabled citizens and it emphasized that humans, animals and machines are interdependent, rather than independent from one another and that this condition has great promise for the purposes of the disabled community.

The public event at the Boerhaave Museum was well attended. The visitors were from the general public as well as those representing interest groups. It was highly useful for setting the stage of the workshop, as the lectures by Draaisma and Bijlo exemplified the issues of:

- Absence and agency.
- Disability, impairment, and diversity.
- The diverging approaches used in different fields of academia (i.e., history, anthropology, media studies, empirical studies, computer science, medical science).

The outcomes of these general talks aligned with the themes targeted in the workshop. The workshop itself showed the necessity of introducing the research topics from different research perspectives. Researchers from different fields take different angles and use different jargon. The plenary talks in the morning sessions were important for getting used to the language from the different fields; the discussions in the afternoon for understanding each other's language and for targeting questions on the cultural life of absence in the specific fields (history of disability, disability and impairment in language and literature, and human animal-robot nexus).

The attendance of researchers with a visual and auditory impairment led to concrete examples of agency and visibility (e.g., through sign language interpreters, discussion not only by pointing but also by describing). This was highly useful for everyone's understanding and relating to the different themes.

The final discussion on day three focused on three overarching questions:

- Self-identity and value systems.
- The relation between the human and non-human.
- Absence to agency.

Important conclusions were that further discussion amongst researchers is essential: in terms of self-selection of value systems, of the production and ordering of spaces, and the reordering of diagnosis, scholars need to develop a role in allowing these processes, spaces, and multiple narratives to come forth. One specific research element was diagnosis and intervention of disability. Although the aims of biomedical models of (dis)ability and subsequent steps in rehabilitation techniques are useful to some extent, they should not bypass the individual's sense of agency and empowerment. In that respect the line between absence and agency is always subject to the individual's presence in the context of different power relations (both positive and negative).

On the basis of these outcomes, future steps are being explored, mainly in the academic arena, for further discussion (through journal articles and international meetings).

Monika Baar (Leiden, Netherlands)
Anne Baker (Amsterdam, Netherlands)
Elise de Bree (Amsterdam, Netherlands)
Piet Devos (Montreal, Canada)
Douwe Draaisma (Groningen, Netherlands)
Babette Hellemans (Groningen, Netherlands)

WorkPlaNS

WORKshop for PLAnetary Nebulae observationS

25 - 29 January 2016 @Oort

The WORKPLANS meeting and its format were inspired by previous meetings organized by the evolved stars scientific community and by the conception of the Lorentz Center events. The aims of the WORKPLANS were:

- To set up an excellent network of researchers in the planetary nebulae (PNe) field.
- To discuss the most relevant topics to be investigated by the community in the following years.
- To prepare high-level observing proposals for the most modern telescopes available at present to address those topics.
- To develop strategies for future observatories.

The week between Jan 25th and 29th was filled with interesting talks and fruitful discussions. On Monday of that week, we focused on general/review talks to bring up the main key questions the community should tackle in the next years. We also had a special session dedicated to one of the next-generation facilities; the James Webb Space Telescope. From Tuesday till Thursday, we concentrated on specific wavelength ranges. In the mornings, we hosted talks focused on the observational window of the day and we had parallel group discussions during the afternoons. Each of these parallel group discussions were dedicated to a specific scientific key question, and its ultimate aim was to outline observing proposals to tackle such questions. After 2 hours of parallel group discussion, we regrouped all the participants in the main auditorium and hosted a summary by the group leaders. These summaries were initially programmed to occur at the end of each day. However, by having them in the middle of the afternoon we allowed a better interactivity between the groups, and enable the participants to commute among different discussion groups, as the groups proceeded with the parallel discussions after the summary break.

The number of participants in our meeting was 51. This includes (one of) the organizer Dr. Joel Kastner, who had the plan to come to Leiden but was unable to fly due to bad weather conditions and paperwork problems. He still participated remotely throughout the week. Attached to this report, we present 5 pie charts with statistical information on the 51 participants. Chart A shows the gender ratio, chart B shows the fraction of the career stages of the participants, chart C merges the information from charts A and B (the participants were divided in career stages by gender), and charts D and E show, respectively, the continents and countries where the participants are/were based on (at the time of registration). Notice that the identification of the career stage of a researcher is subjective. Single characteristics like age, position, role inside a research group or number of publication are not sufficient to place the researcher in a given stage career if considered alone. Therefore, we highlight that charts B and C should be analysed with caution.

By the end of the workshop we had 6 groups well established, and a number of observing proposals outlined. The follow-up of the proposals in preparation are being done through a website/wiki that we created and which all participants were invited to join. This tool allows new members (either someone that could not attend the meeting or someone that participated on a different discussion group) to also join a specific observing project.

On top of the 6 groups listed above, one observing proposal which was already in preparation by one of the WORKPLANS organizers was brought up for discussion and significant inputs were given

by the community. This observing proposal was submitted to the Submillimeter Array on the week immediately after the WORKPLANS, and we can consider it as the first successful outcome of the meeting.

It is also relevant to mention that by bringing up experts in different realms of the spectrum together and by having the meeting format filled with discussion slots, the synergy between the (sub-) communities was facilitated and common points of interest were identified. Even though we can encounter the same diversity of experts in a regular conference, the format of the WORKPLANS and the infra-structure of the Lorentz Center enabled an exchange of ideas that I did not experience in any of the meetings I attended before. Given the mentioned outcomes, and also based on the very positive feedback we received from the participants, we consider the meeting a success. Moreover, we are currently discussing the potential organization of the WORKPLANS 2.

Isabel Aleman (Leiden, The Netherlands)
Joel Kastner (Rochester, NY, USA)
Djazia Ladjal (La Serena, Chile)
Marcelo de Lima Leal Ferreira (Leiden, The Netherlands)
Alexander Tielens (Leiden, The Netherlands)
Toshiya Ueta (Denver, CO, USA)

Population Consequences of Sound Impact on Fish

25 - 29 January 2016 @Snellius

The explicit targets of this meeting were:

- Evaluate the applicability of a PCAD-approach and alternatives for assessing sound impact from seismic surveys on fish populations.
- Gap analysis for critical information that is missing for such impact assessment.
- List and prioritize research ideas. A total of 32 people contributed to and/or participated in the workshop, including scientists from the Netherlands, Belgium, Denmark, Sweden, Norway, the UK and the USA.

This workshop concerned a theoretical evaluation of the effects of airgun exposure on fish using the Population Consequences of Disturbance (PCoD) approach. We explored the conceptual framework, which is new to this taxonomic group, and evaluated the current state of the art with respect to all critical parameters and transfer functions for a fully developed Population Consequences of Acoustic Disturbance (PCAD) model, for which the applicability of transfer functions for various steps and research angles were debated. We also determined whether Production Susceptibility Analyses (PSA) or Expert Elicitation (EE) offer good alternative or complementary tools. And finally, we assessed whether theoretical modelling or practical data collection will be most useful and cost-effective to fill in gaps of knowledge.

The five days of the workshop were structured in the following way: every day several key-note speakers provided an introduction to a particular aspect of the PCAD-model or one of the transfer functions within the sub-discipline of their expertise. Afterwards, plenary discussions or break-out sessions in smaller groups were used for gap identification and exploration of research strategies. We started at a broad-scale level of populations and several types of modelling, to go down in details towards physiological and behavioural effects on individual fish. Parallel to this, we also addressed feasibility of potential research plans and started off in details on practicalities and experimental design related to tagging and telemetry of free-ranging fish and sampling responses to real seismic surveys with adequate replication and appropriate controls.

Towards the end of the meeting, feasibility of bottom-up and potential for top-down approaches were integrated into a set of consensus statements that could serve as guidelines for future studies. The overall outcome can be summarized in the following four statements:

- The most effective way to make progress in impact assessment is through complementary modelling and replicated data collection.
- Quantitative population analyses require field measurements for a model species on multiple life stages and the local community.
- Modelling combined with sound exposure probability can be used to compare sensitivity of species, life stages and ecological context.
- There is a strong need for data on natural patterns of particle motion in fish habitat and the modifications by human-made sound.

The interdisciplinary nature of the workshop made that the eyes of several participants were opened to potential for integration and to subtle but prominent mechanisms apparent in neighbouring research fields. An example of the first was the high potential to apply the PCAD-approach to the taxonomic group of fishes and an example of the second was the sometimes dramatic and counterintuitive interactions among trophic groups in marine ecosystems as illustrated by multi-trophic stock modelling. The format at the Lorentz Center is excellent and provides plenty of opportunity for scientific discussion, planned and accidental follow-ups in plenary setting and subgroups of various sizes.

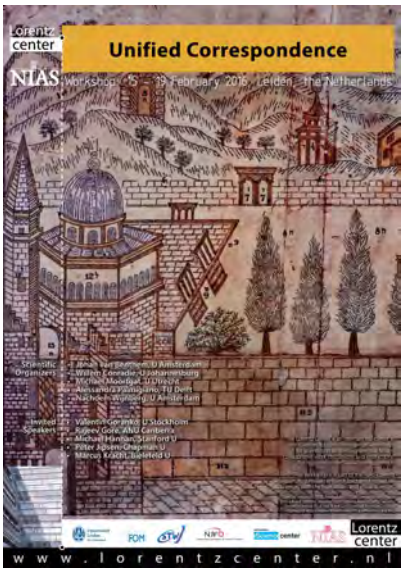
The findings of the workshop and the associated gatherings and interactions in the period before and after have been summarized into a report and form the basis for a proposal for funding a large and integrated research project. The targets of this four-year project are:

- A fully integrated research schedule with energy budget and population modelling and empirical data collection.
- First time ever impact study of real seismic survey on free-ranging fish using individual tags for weeks before, during and after.
- Direct comparison of behaviour in the wild with behaviour and physiology in semi-captive conditions for adult and juvenile stages.
- Measurement and modelling of natural patterns of particle motion and the modification of these patterns by human-made sound.

John Harwood (St Andrews, United Kingdom)
Hans Slabbekoorn (Leiden, Netherlands)
Jon Egil Skjaeraasen (Bergen, Norway)
Martina Vijver (Leiden, Netherlands)
Erwin Winter (IJmuiden, Netherlands)

Unified Correspondence

15 - 19 February 2016 @Oort



Description and Aims

The aim of the workshop was to create an environment for research projects at the interface of non-classical logic, categorization theory in management science and categorial grammar in linguistics, pivoting on unified correspondence as the main technical tool.

The workshop brought together experts in unified correspondence theory, proof theorists, researchers in categorization theory in business science and in categorial grammar in linguistics. The workshop intended to raise the interest in unified correspondence theory both inside logic and outside of it, specifically targeting two promising areas of application, in management science and in linguistics, respectively. Both aims have been fulfilled.

Format of the Workshop

In order to foster interaction between the various communities, the program was divided into keynote lectures, discussion groups and work sessions. To give PhD students a forum, we started on Monday with 5 presentations of 10 min by PhD students.

Discussion groups had an assigned leader who prepared a short introduction and then opened the floor for discussion. The topic of the working groups where suggested by the participants.

Outcomes

The format of the workshop facilitated extended discussions between the participants and helped the communities to find a common language. Proof-theorists were encouraged to investigate the emerging links between correspondence phenomena and analyticity of different types of proof calculi. Linguists and researchers in management science appreciated that the areas of common interests is in fact larger than they had initially foreseen.

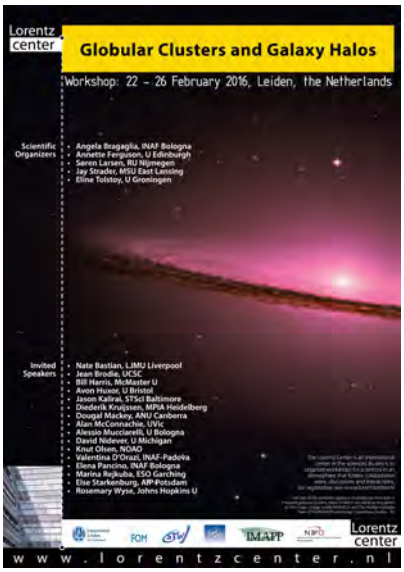
Highlights

The highlights of the workshop were the work sessions, in which various discussions on topics ranging from introductory to advanced took place. All participants engaged, and gave enthusiastic feedback. More in general, participants declared the workshop a success and look forward to other similar installments. Some research outcomes of this workshop have already materialized, showing the potential of unified correspondence theory as a tool to investigate the logical foundations of categorization theory in management science. For instance, the paper:
W. Conradie, S. Frittella, A. Palmigiano, M. Piazzai, A. Tzimoulis, N. Wijnberg, Categories: How I Learned to Stop Worrying and Love Two Sorts. Proc. WoLLIC 2016, ArXiv preprint 1604.00777.

Johan van Benthem (Amsterdam, The Netherlands)
Willem Conradie (Johannesburg, South Africa)
Michael Moortgat (Utrecht, The Netherlands)
Alessandra Palmigiano (Delft, The Netherlands)
Nachoem Wijnberg (Amsterdam, The Netherlands)

Globular Clusters and Galaxy Halos

22 - 26 February 2016 @Oort



Science

The aim of our workshop was to bring together experts on the stellar *halos* around galaxies and the globular clusters that are associated with these halos. We wanted to contrast and compare the properties of GCs with other halo tracers in nearby galaxies, in order to assess the limitations of using GCs as primary halo tracers in more distant systems. In particular, we discussed:

- Whether one gets a consistent picture of halo properties from different tracers (different types of individual stars, GCs, planetary nebulae).
- How universal various properties (such as metallicity distributions, age-metallicity relations and detailed chemical abundances) of stellar halos and GCs are in different galaxies.
- How such information may be used to constrain galaxy formation scenarios. We also discussed the puzzling phenomenon of *multiple stellar populations* within globular clusters, and whether it is possible to put together a consistent picture for their origin.

Prior to the workshop, we had hoped to identify types of investigations where it is "safe" to use GCs as tracers of halos, as well as areas where further research is needed. At the end of the week, a consensus seemed to be emerging that GCs are excellent tracers of halo substructure, and may indeed be very useful ways to identify streams and other remnants of past accretion events. However, as pointed out by Bill Harris in the conference summary, it is also clear that the biggest question remains unanswered: *How do GCs, along with the halos, actually form?* There are various scenarios, but a real theory is sorely lacking. This may come from more sophisticated computer simulations, which are now becoming feasible.

Much of our scheduled discussion on Wednesday afternoon revolved around multiple populations in GCs, and many participants were keen on continuing this discussion in a splinter session on Thursday. A possible new formation scenario was discussed, but it was not clear whether this new scenario is feasible. Some of the participants will take a closer look and perhaps this will result in a publication.

The discussion of future instrumentation on Tuesday afternoon was very useful. It tied in well with the discussion of GCs in the outskirts of galaxies, and it seems clear that many of the upcoming facilities (such as Euclid, LSST) that will image large parts of the sky at high resolution and/or in multiple colours will enable a much more complete census of such remote GCs. This discussion certainly motivated the SOC chair to join the Euclid consortium.

Organization

Many participants stated that they enjoyed the facilities and the support provided by the Lorentz Center very much. This is also true for the organizers: we have been very happy with the support, and we had a very useful discussion during the intake meeting that helped us plan the workshop. Some participants (particularly the session chairs) initially thought that the large amount of discussion time after each talk seemed somewhat excessive. But it was actually very good; there was lots of good discussion and the session chairs did an excellent job managing the discussion in the "wrap-up" time at the end of each session.

For the Wednesday afternoon discussion, we had asked the participants to submit questions that they would like to see addressed. We then collected these questions into a few overall themes. For each theme, we started by asking the participants who had submitted questions to elaborate a bit on why they asked those questions, and then the discussion was allowed to flow freely (with a minimum of steering from the moderators). This went very well and we had a very lively discussion.

Angela Bragaglia (Bologna, Italy)
Annette Ferguson (Edinburgh, United Kingdom)
Søren Larsen (Nijmegen, The Netherlands)
Jay Strader (East Lansing, United States of America)
Eline Tolstoy (Groningen, The Netherlands)

Tightening the articulation between language and number

8 - 11 March 2016 @Oort

During this workshop, we brought together leading specialists from linguistics, neuroscience, and developmental psychology to discuss the cognitive systems that have been proposed for the representation of number.

The relation between the cognitive and linguistic development of number, in particular with respect to counting and number word acquisition, as well as their relationship to language itself are poorly understood and hotly debated. In particular, there is no consensus on the aspects that must be ascribed to numerosity proper and those that can be attributed to more general processes, such as memory or perception.

This interdisciplinary workshop on the relationships between core and external systems of number and language and their interaction greatly enhanced our understanding of a number of the issues described above.
In order to prepare the workshop, we had asked the participants to provide an abstract of their presentation as well as some additional relevant publications. This allowed participants to better prepare for the workshop. The talks and discussions centered around the following 4 broad themes:

1. The acquisition of number

The presentations by David Barner, Susan Carey, Rochel Gelman, and Charles Yang focused on the mechanisms and factors that influence the acquisition of numbers by young children. Jeffrey Lidz reviewed data from the acquisition and use of proportional and comparative quantifiers (*most* and *more*). Using a mix of psychophysical and behavioral techniques with children and adults, he showed that the extralinguistic systems that provide content for quantificational expressions can be used to probe the fine details of linguistic meaning.

2. The cognitive representation of number

Stanislas Dehaene presented recent research with Christophe Pallier using functional magnetic resonance imaging that shows that brain areas that play a central role in language syntax are not the same as those that are active in various aspects of mathematics. Randy Gallistel focused on the relation between the approximate number system and the exact number system, arguing that the brain represents and arithmetically manipulates discrete and continuous quantity. Elizabeth Spelke argued that natural number concepts emerge over the course of human development and depend on three innate, early emerging cognitive systems: a system for representing approximate numerical magnitudes, a system for representing up to three distinct objects and their mechanical interactions, and the system supporting learning of a natural language. Stella Lourenco argued that number is should be viewed as part of a 'general magnitude system', in which there is convergence of numerical and non-numerical magnitudes. Number and other magnitudes are not processed by fully differentiated systems.

3. Number and quantity in morphosyntax and semantics

Richard Kayne, Pierre Pica, and Johan Rooryck presented research on the morphosyntactic analysis of number in various languages. Richard Kayne presented ongoing research on the underlying syntactic representation of the lower numbers. On the basis of data from Mundurucu, Pierre Pica developed an analysis of both approximate and exact number according to which a number is the result of the successor function mapping sets expressing numerical values into numbers. Johan Rooryck provided an analysis of the expression of paucity and abundance in Mundurucu comparing it to related expressions in French and English. Manfred Krifka and Lucas Champollion presented an overview of approaches to number and quantification in formal semantics.

4. Number in nonhuman animals

Tetsuro Matsuzawa and Justin Wood focused on number representation in animals, Tetsuro Matsuzawa presented results from his research on the numerical cognition of chimpanzees, who outperformed human adults in memorizing briefly presented numerals in a masking task. These chimpanzees were less proficient at a variety of other cognitive tasks, suggesting that they do not possess human-like capabilities for the representation of number at an abstract level. On the basis of data from a high-throughput controlled-rearing approach, Justin Wood showed how advanced visual-cognitive abilities like object recognition and number representation emerge in the brain of newborn chicks.

The objectives of the workshop were largely reached, and all participants were very satisfied about the quality of the discussions and questions.

Pierre Pica (Paris, France)
Johan Rooryck (Leiden, The Netherlands)

Statistics of Extrema in Large Scale Structure

7 - 11 March 2016 @Snellius

The workshop focused on the theoretical modelling of the formation and evolution of objects, halos/galaxies as well as voids, in the cosmic mass distribution on the basis of analytical descriptions. Prominent in these are the peak model and the excursion set model, both of which allow to predict on the basis of Gaussian statistics of the primordial density field what objects emerge at which epoch, and what their mass spectrum and distribution of other properties are. Over the past years, there has been a substantial advance in these models, largely supported by computer models and simulations and the availability of large datasets of galaxy surveys.

To this end, the workshop brought together some 25 experts on different aspects of analytical modeling of the cosmic mass distribution. Particularly noteworthy was the presence of Nick Kaiser and Alex Szalay, two authors of the seminal paper in this field, BBKS from 1986 (regretfully, prof. J.R. Bond at the last moment had to refrain from participation). The setting of the Snellius Center proved ideal for the highly interactive workshop, involving numerous discussions between (groups) of participants. The program involved a range of (review) talks that set the framework for the subsequent open discussion sessions. The size of the participant group and the glass desk cubicles encouraged this interactive atmosphere.

The first day of the workshop centered on the central topic, the identification of peaks in the primordial density field with emerging objects, both in terms of simulations (e.g. Porciani) as well as in the discussion on several analytical (galaxy) bias models. The second day centered on voids, the under dense regions in the cosmic mass distribution, while the third day centered on analytical and geometric models of the dynamics and evolution cosmic web. Also impressive results were presented on the success of accurate mathematical models for the evolution of the statistical properties of the cosmic mass distribution centered on the fourth day, in particular in the contributions C. Uhlemann and S. Codis. The connections with observational data were the subject of the fourth day, both in terms of simulations as well as from a pure observational perspective (M. Takada). The workshop also included a special review by Miguel Aragon-Calvo, supported by the e-science center. His combined expertise in cosmology, cosmic structure formation and scientific visualization had prodded us to invite him in order to allow the support of state-of-the-art visual techniques in guiding the development of theoretical models.

In summary, the workshop provided a highly successful and inspiring forum for extensive discussions on a range of - in principle - technical and mathematical issues. It established firm links with simulations, and for applying the developed analytical models to large upcoming cosmological surveys. In all, an appropriate celebration of 30 years BBKS, one of the targets of the meeting!

Tobias Baldauf (Princeton, NJ, United States)
Vincent Desjacques (Geneva, Switzerland; now Haifa, Israel)
Ravi Sheth (Philadelphia, United States)
Rien van de Weijgaert (Groningen, Netherlands)

Optogenetics

From molecules to applications

14 - 18 March 2016 @Oort

The optogenetics field spans many disciplines ranging from biophysics and fundamental molecular research all the way to cell biology, physiology and neuroscience. Here, we have brought together international research leaders to discuss the state and direction of the field in a Lorentz workshop setting.

The workshop was aimed to discuss and develop strategies to obtain 1) more insight into photoreception mechanisms, 2) improved tools for optogenetic control, 3) novel biological insights using optogenetics in advanced model systems. Another important objective is to bring the (slowly) emerging Dutch optogenetics community in contact with international research leaders.

Overall, we can state that this Lorentz workshop was very successful. The morning lectures were of very high quality, with lively discussions following and between the talks and in the breaks. In the afternoon, we had topical workshops (some parallel, some plenary) that were very interactive and lively. Attendance to and participation in lectures and discussion sessions was high, and most participants stayed a significant fraction of the workshop duration, many of them the entire workshop.

We observed fruitful interactions between scientists of very disparate backgrounds. Many participants had never met before. The topical workshops were very much a bottom-up enterprise, where participants decided what to discuss, or what to learn at tutorial-like workshops.

We had the impression that the Dutch participants (senior and junior) very much appreciated the interactions with international research leaders.

The photopharmacology field was unknown to many researchers in the optogenetics field, and vice versa, we believe that this proved to be a very interesting linkage.

We adopted what we would consider a 'classical' Lorentz workshop format, with interactive lectures in the morning and topical workshops/discussion sessions in the afternoon. In our experience, this worked very well for this community. The content of the topical workshops was discussed plenary on the first day, the topics decided on the basis of common interests and workshop leaders were assigned. This worked very well.

Before the workshop, we were worried that there would be too much 'unstructured' time (discussion time and breaks/free time), and that it would lead to participants withdrawing in their offices or leaving early. This did not happen at all. On the contrary, we experienced the workshop as very intense and dynamic.

In some respects, the duration of the workshop (5 days) might be a bit too long. Generally, there is a tendency to keep meetings short these days, the Lorentz center might think about restricting workshops to 4 days. On the other hand, it would have been a shame if our 5th day would not have taken place.

Lukas Kapitein (Utrecht, Netherlands)
John Kennis (Amsterdam, Netherlands)
Andreas Möglich (Berlin, Germany)
Thomas Oertner (Hamburg, Germany)

Open Machine Learning 2016

14 - 18 March 2016 @Snellius

The rise of Machine Learning applications in nearly all aspects of society stands in stark contrast with the irreproducibility of the literature and its inaccessibility to the general public. Therefore, we have developed OpenML, an online collaborative science platform for Machine Learning, available at http://openml.org. The aim of this workshop is to bring together developers and users of the platform to stimulate further development.

Tangible outcomes

During the workshops and the weeks after that, we:

- developed *novel interfaces for scikit-learn and mlr*, which allow anyone to run a wide range of experiments in either Python or R. These are now actively in use.
- *included more scientific datasets* into OpenML, including 16,750 QSAR datasets to stimulate and open up drug discovery research.
- submitted papers to *R Journal*, the *UseR conference* and the *Machine Learning Journal*. Other joint papers are underway.
- submitted a *proposal to the EU COST program*, to set up a European Network of Excellence around data-driven science. It includes many of the workshop participants.
- grew a stronger community of young enthusiastic scientists that continue to collaborate.
- boosted a novel W3C Community Group on semantic schema for machine learning.

Scientific breakthroughs

The philosophy of OpenML is frictionless online collaboration, and thus accelerate machine learning and data driven discovery. We have definitely advanced towards that goal, and made it significantly easier for researchers in other sciences, as well as students and the general public, to explore, use and contribute to machine learning research. We also identified challenges in running and reproducing benchmarks of machine learning algorithms. We have started the largest study to date to provide truly meaningful benchmarks.

Workshop format

The workshop was organized as a hackathon, an event where participants present their goals and ideas, and then work on them in small teams for many hours or days at a time. There were also plenary keynotes and tutorials meant for participants to learn how to use advanced features of the OpenML website and experiment with machine learning tools with OpenML integration. The keynotes were high profile speakers on Bayesian optimization (Dr. Frank Hutter), statistical benchmarking (Dr. Anne Laure Boulesteix) and Bioinformatics and open science (Dr. Katy Wolstencroft).

Participant feedback:

Here are a few abstracts from the overwhelmingly positive feedback:

> *I really liked the atmosphere, the talks, the team feeling, the venue, the pizza evening, and the size of the workshop.*

The Hackathon style with people you can poke any time was extraordinarily productive!

I liked the opportunity to acquire experience from a lot of machine learning experts. It was a big experience for me, coming from a different country and background.

The Workshop was extremely well organized and it went on smoothly. I particularly liked the balance between presentations, structured meetings and spontaneous gatherings, with end-of-the-day wrap-ups and online follow-ups.

Altogether, we think the workshop was a great success and it pushed the idea of Open Science in Machine Learning forward by the continued development of OpenML.

Bernd Bischl (Munich, Germany)
Jan van Rijn (Leiden, The Netherlands)
Larisa Soldatova (Middlesex, United Kingdom)
Joaquin Vanschoren (Eindhoven, The Netherlands)

Fixed Parameter Computational Geometry

4 - 8 April 2016 @Oort

Description and aims

Algorithms and data structures form a key component of any software system. Many algorithmic problems arising in practice are intractable, which means there are no fast algorithm solving these problems optimally on all problem instances. The area of fixed-parameter tractability tries to gain more insight into such problems, by analyzing them in terms of some well-defined parameter(s) that capture the difficulty of the problem. In many applications, algorithms are needed for problems involving spatial data. Computational geometry is the area within algorithm research dealing with spatial data. This workshop brought together researchers from the areas of computational geometry and fixed-parameter tractability, to advance the study of intractable problems on spatial data.

Outcome

We believe that the workshop was very successful in what it aimed to establish. The workshop excelled in a lively atmosphere with participants that learned a lot from the other field (and a little bit as well from their own), scientific research in intensive discussions in groups, new collaborations being formed that did not exist yet.

During the workshop, the participants worked in small teams on a number of open problems. We made a small survey by email among the participants, and many reported that they are currently working on joint papers with other participants, based upon work that was initiated / done during the week of the workshop in the Lorentz center.

Scientific Developments and Aha-insights

There were no `great scientific breakthroughs' in the workshop, but instead, a large collection of interesting new developments, smaller insights, and new work in progress. A partial list of such results is: red-blue separation; graph drawing; disk graphs; unit disk graphs; dominated "hypervolume" and convex-hull volume selection; maximum number of points in general position.

There were several aha-moments by participants, in particular when unexpected connections between the fields were shown in lectures or during work on problems, e.g., the tutorial by Benjamin Burton showed the (for many unknown) connection between topology (including the theory of knots) and graph algorithms (in particular, the notion of treewidth).

Format

We had a number of tutorials, a number of talks by participants explaining recent work, and open problem sessions and progress reports, with an outlook lecture at the end of the workshop. After the first open problem session, participants formed groups to work on the stated open problems.
We plan to organize a follow-up workshop, with a similar format: possibly somewhat less tutorials as the participants are now more up to knowledge of the different fields and possibly with additional emphasis on topology.

Other comments

We thank the Lorentz staff for the excellent help in all aspects concerning the workshop. Probably due to the timing in the year, several senior staff cancelled, often due to obligations at their own universities; but we also had a relatively large number of requests for participation by younger scientists, attracted by the topic of the workshop. This proved to be beneficial for the workshop, as these younger participants were very active in cooperation and discussion. We had a short email survey with the participants of the workshop; information in this report is partly based on the comments of participants.

Mark de Berg (Eindhoven, The Netherlands)
Hans Bodlaender (Utrecht, The Netherlands)
Michael Fellows (Darwin, NT, Australia)
Christian Knauer (Bayreuth, Germany)

Dark Matter on the Smallest Scales

4 - 8 April 2016 @Snellius

Our workshop aimed to bring together researchers working on low-mass dark matter haloes from both an observational and numerical perspective. With the recent detections of new satellite galaxies found around the Milky Way and at higher redshifts with gravitational lensing, and due to the advances made in simulations, the time had come to re-address several astrophysical questions about the formation and evolution of dwarf galaxies, and to devise a unified model to describe the dark matter halo mass function both locally and its evolution with redshift. During this workshop, several research teams were brought together to tackle these issues and to define the important research goals where progress can be made over the next few years.

Determining the normalization and the slope (including any potential turnover) in the dark matter halo mass function to the lowest observable masses (10^6 to 10^9 $M_\odot$) can constrain models for galaxy formation that include baryonic processes, and also the nature of the dark matter particle. This is because in the currently accepted hierarchical galaxy formation model, where structure forms through the mergers of smaller mass systems, we expect a rich population of low-mass haloes to survive the merger process, leading to a significant number of so called dark matter substructure that are observed as low-mass dwarf satellites through their faint stellar luminosity in the Local Group or through their perturbing gravitational effect within distant gravitational lenses. The paucity of low-mass substructures found around our own Milky Way has led to some tension with the Cold Dark Matter (CDM) scenario of galaxy formation.

The Dark Matter on the Smallest Scales workshop, held at the Lorentz Center in spring 2016, involved around 30 scientists working in both observations and theoretical/numerical modelling, who study both the dwarf galaxy abundance within the Local Group and at much higher redshifts with gravitational lensing. These scientists came from 7 different countries, with a strong Dutch presence (15-20%), and included PhD students, postdoctoral researchers and staff scientists.

The primary goal of the meeting was to bring different fields together, to understand what synergies existed, what new collaborations could be formed, and to find common areas of interest. In this respect, the meeting was a massive success. Two observational probes were identified as potentially the key measurement that can test the cold dark matter model on the smallest-scales; namely, stellar streams within our own and nearby galaxies and gravitational lensing with very long baseline interferometric observations.

The meeting allowed these two observational communities to come together, but also to interact with the community working in simulations. Again, this connection was a massive success. A key result from the extensive plenary and small-group discussions was that one of the cleanest tests of these models identified may be the (gravitational lensing) detection of low mass dark matter haloes along the line-of-sight to distant galaxies. Such low-mass haloes would not be effected by the baryonic processes within larger galaxy-scale holes. This resulted in a number of new teams forming to investigate the feasibility of such detections and quantifying their relevance for different dark matter models; it was only through having the expertise in gravitational lensing, observations, analytical models and numerical simulations in the room that such a breakthrough could be made and a number of papers, based these discussions are in preparation.

Overall, the meeting was very informal, with extensive periods made available for discussion during each talk, and after, that led to a deeper understanding and transfer of knowledge between each of the groups. The organizers were often thanked by the participants for the style and schedule of the

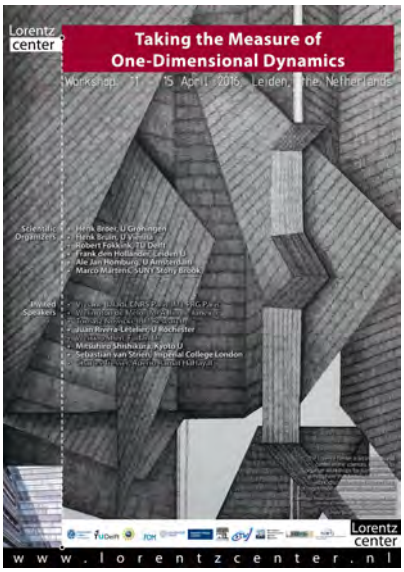
meeting, which we hope will be replicated in future meetings.
Given the success of the workshop, a larger Lorentz Center@Oort meeting is being planned, which will allow a larger number of the scientists working on small-scale structure to attend, and to follow-up the key ideas that where identified during our Lorentz Center@Snellius workshop.

We'd like to thank all the staff at the Lorentz Center for their advice and constant support during the preparation and actual running of our workshop.

Anna Frebel (Cambridge, USA)
John McKean (Groningen, Netherlands)
Tommaso Treu (Los Angeles, USA)
Simon White (Garching, Germany)
Simona Vegetti (Garching, Germany)

Taking the measure of one-dimensional dynamics

11 - 15 April 2016 @Oort



A full analysis of the evolution of nonlinear dynamical systems can, as is well-known for chaotic systems, at most be given for typical trajectories and parameter values. Already in dimension one, real or complex, the classification of Lebesgue typical orbits for typical parameters is a tremendous effort, but one that led to remarkable progress in the last three to four decades.

The logistic family and complex rational maps and their Julia sets are frequently used as show-cases of chaos and as toy models in various applications, but also directly in models in higher dimensions. For example, the study of the Hénon family, with its important role in the unfolding of homoclinic bifurcations, is directly inspired by one-dimensional techniques, and current results on renormalization and invariant Cantor sets is a fascinating enrichment of the topic.

This workshop brought together the main players that were responsible for this development with new researchers in this field. Substantial progress is still being made in a variety of subtopics, including critical circle maps, renormalization theory and rigidity. Old problems were evaluated, new methods, and future directions were outlined. The emphasis was on the analysis of real dynamics, which as Sebastian van Strien pointed out in his lecture on the main open problems in this field, is performed by real men. This Lorentz workshop has a follow-up at Imperial College in London - Parameter Problems in Analytic Dynamics - with an emphasis on complex dynamics.

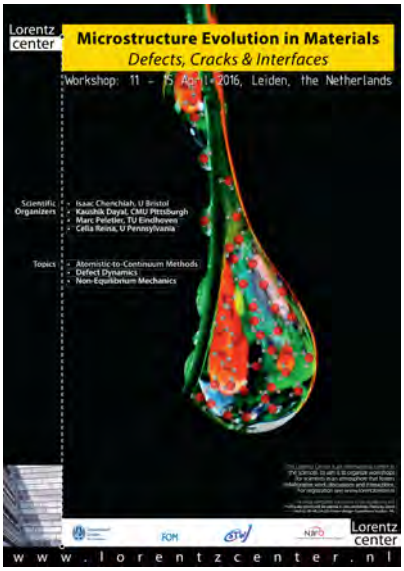
There were a total of fifteen talks in five days and much time was left open for discussion, which was often initiated during the lectures with many of the participants asking questions or making suggestions, to the speakers and to other people in the audience. This has been a very lively workshop and everybody enjoyed it. The results of these discussions will appear in printed form in 2018 in a special issue of Indagationes Mathematicae, which is dedicated to this workshop and the workshop in London.

Henk Broer (Groningen, The Netherlands)
Henk Bruin (Vienna, Austria)
Robbert Fokkink (Delft, The Netherlands)
Frank den Hollander (Leiden, The Netherlands)
Ale Jan Homburg (Amsterdam, The Netherlands)
Marco Martens (Stony Brook, NY, USA)

Microstructure Evolution in Materials

Defects, Cracks & Interfaces

11 - 15 April 2016 @Snellius



Scientific Motivation and Aim

Material behavior is determined not only by atomic-scale physics and geometry; rather, a vast range of additional length and time scales intervene through defects such as vacancies and dislo¬cations at the nanometer scale or grains and texture at the micron scale. Each of these defects, as isolated entities within otherwise perfect materials, are currently fairly well understood. How¬ever, the understanding of their evolution, organization and collective behavior remains at its infancy, and this currently represents a bottleneck in computational material design. The goal of the workshop was to create a scientific environment ideal for obtaining an enhanced understanding of (i) the macroscopic material behavior resulting from the collective interactions of defects (e.g. dislocation ensembles towards macroscopic plastic deformation of the material, defect interactions in biological tissues); and (ii) the relations that govern the microstructure evolution (e.g. motion of phase transforming interfaces, dynamic fracture).

Workshop format

The workshop was attended by well-known experts in modeling and simulation at multiple scales, non-equilibrium statistical physics and mathematical analysis, as well as by younger investigators with fresh and novel approaches.

The 5-day workshop had a special format in order to focus on open questions and discussion. More precisely, each day had an average of 4 one-hour talks, which were moderated by a com¬mentator that ensured effective discussion and interchange of ideas. Additionally, the talks were aimed at providing a short overview on the methodology since its formulation till the current state, and also made special emphasis on the existing open problems, the specific challenges they involve and the potential paths to solve them.

Outcome

The format of the program proved to be highly successful and was cherished by all of the participants. Actually, all the talks ended up lasting one hour and a half and sometimes even beyond, due to the many interesting discussions that they originated; the fact that this was possible was highly appreciated (quote: 'All workshops should be like this!'). Additionally, many small focus groups were formed during the week, where progress was made on ideas that spun off from the conversations, and which often lasted to the late evenings.

Acknowledgement

All the organizers and attendees are very grateful to the Lorentz Center. The wonderful facilities established a perfect environment for scientific discussion. We are also very thankful for their hospitality, administrative support during all stages of the organization, as well as the financial support. All of the above have been crucial for the success of the workshop.

Isaac Chenchiah (Bristol, United Kingdom)
Kaushik Dayal (Pittsburgh, USA)
Mark Peletier (Eindhoven, The Netherlands)
Celia Reina (Philadelphia, USA)

Game Theory and Evolutionary Biology

Exploring Novel Links

18 - 22 April 2016 @Oort

The aim was to bring together experts in (evolutionary) game theory and (evolutionary) biology in order to discuss and learn about connections between the two fields, unresolved problems, novel techniques that could resolve such problems, and in general crucial challenges for future research at the intersection of these two fields. After the introduction of main topics a lot of time was dedicated to brainstorming and working in groups to reach these goals.

We expect that new research lines among the participants of the workshop will be set up. There is a new research on Warburg effect, for example, which started at the workshop, and multiple workshop attendants, who were originally working in different fields, are working on other topics at the intersection of game theory and biology, thanks to the workshop.

Some of the topics that are worked on by the workshop participants after the workshop are approached from a completely new (and often very innovative) angle, thus, if successful, these efforts are expected to lead to scientific breakthroughs. There were quite some excellent "out of box" ideas found during the workshop.

There were a few 'Aha' moments. For example, in the working group of cancer, which I participated, we got to understand that cancer is an evolutionary disease and as such should be definitely modeled using the evolutionary techniques, plus it has more in common to modeling other biological systems than we thought. That is why, surprisingly, also often rather theoretical expertise of some participants led to the better understanding/predicting the disease.

We started with series of tutorials introducing the mathematical and biological topics, after that we asked participants to write down questions that interested them and others could sign themselves under these questions - that is how the brainstorming groups were formed. There was then considerable time given to group discussions on days 3, 4, 5, and at the end the groups presented their outcomes to the others. In the morning on days 3 and 4 we also introduced the so-called shake-up talks which looked on the topics introduced in the tutorials from different perspectives. The workshop was ended by a talk on evolutionary biology and games.

I believe this format was successful. Interesting was that we got only 3 big groups initially: one dealing with cancer (A), second one dealing role of information/learning in biological modeling (B), and the third one dealing with what the fitness is (C). The cancer group was the biggest one and after first few meetings this group broke into 3 subgroups. Within these subgroups, people started to work on rather diverse topics (but all within the general topic of cancer), there were even some modeling results still shown within the workshop! Groups B and C were more theoretical, they were evaluating/comparing different existing theories/approaches and pointing out what still needs to be done or what should be corrected within their research domains. I think it was very good that we asked the groups to report on their results, because that gave them target and that made people really work together actively (I myself started important collaborations at the workshop). Most participants were really excited about the topic they were working on, thus you could see that progression went fast.

There were few participants who did not really actively participate in the discussions and working in the groups. Some of them were there only to learn and/or did not want to/were afraid to express their opinion (this concerned some of the PhD candidates), there was one participant who was "hopping"

between different groups, not contributing to any of them at the end. While this was a bit of pity, luckily most of the participants did participate actively in the workshop and we really learned a lot from each other.

The shake-up talks were very good addition to the main talks, as they gave a different point of view to rather standard topics.

I heard quite some participants saying that this was the best workshop they have attended so far and I thank this very much thanks to the Lorentz center. Everything was arranged very professionally, we got all the space we needed for our work, people seemed relaxed and happy and that is the best state of mind to do significant research. Tara and other people working at the Lorentz center were very helpful, Tara was even giving me some very useful tips during the workshop. The meeting with the Lorentz Center before we finalized the program was an eye-opener, it made us to improve the program very much. It is clear that the Lorentz Center has much experience with organizing scientific workshops, which helped us a lot to improve the organization of our workshop. The boat trip that we had as our social event was great, so was the wine and cheese party. There is no single negative point I could state.

Kateřina Staňková (Maastricht, Netherlands)
Johan Jacob Metz (Leiden, Netherlands)
Tom de Jong (Leiden, Netherlands)
Nicole Mideo (Toronto, USA)
Frank Thuijsman (Maastricht, Netherlands)

Emotions as Feedback Signals

18 - 22 April 2016 @Snellius

Emotions are social signals aimed at shaping the behavior of others, as well as private signals aimed at shaping one's own behavior. But how do emotions do that, and where do they come from? This workshop brought together neuroscientists, computer scientists, and psychologists working in the fields of emotion, development, and learning. A total of 24 participants participated in the workshop from a wide variety of nationalities and disciplines.

Key questions that were addressed include how is emotion grounded in adaptive behavior and development, and, how can emotion be used as an influencing factor on perception-action loops, and hence on behavior? Further, significant effort was spent at investigating the different relations between emotions and feedback signals (are emotions feedback signals, do emotions emerge from feedback signals, are all emotions feedback signals, and, is feedback to be interpreted in the classical cybernetic sense). As anticipated, we did not achieve convergence on these matters. However, it was uniformly concluded that the relationships between emotions and feedback signals are diverse, multi-faceted and complex and, to address these questions, methods and insights from computational modelling, developmental robotics, experimental psychology and the neurosciences need to be combined.

The workshop was instrumental in identifying a common ground to further investigate the multiple ways in which emotion can be conceptualized in terms of feedback signals, in the context of learning novel behavior, or adapting existing behavior, and even social situations. Working groups at the workshop discussed some of these relationships, as well as the nature, functions, development and evolutionary roots of selected examples of emotions conceptualized as feedback signals from both intra-personal and inter-personal (in dyads, groups and crowds) perspectives. The workshop also showed that more effort needs to be put in generating shared understanding of what emotions and feedback signals mean, and what is meant by those concepts in the different disciplines.

Significant joint effort and networking has followed the workshop in the form of visits for invited lectures, plans for joint articles, as well as several jointly written manuscripts. A special issue in a high impact journal covering the main conclusions form this workshop in more detail as well as individual contributions by participants and other invited contributors is planned.

Joost Broekens (Delft, the Netherlands)
Lola Cañamero (Hatfield, United Kingdom)
Carolien Rieffe (Leiden, the Netherlands)

Assessing hallucinations across diagnoses

28 - 29 april 2016 @Oort

Description and aims

The Questionnaire for Psychotic Experiences (QPE) is a newly developed clinical interview aimed to assess hallucinations and delusions. The workshop was focused on the assessment of hallucinations across different patient populations, with the QPE as its primary outcome. It tried to unravel difficulties in the assessment of hallucinations from several clinical perspectives, provided training in QPE administration to both national and international researchers, and discussed the process of translating and validating the QPE in languages other than Dutch.

Outcome and "Aha" moments

The final product of the workshop is an updated QPE manual suited for QPE administration across different disorders. By organizing the workshop, we were able to detect common pitfalls during QPE administration, which has led to constructive improvement of the manual and several items of the QPE. A second outcome of the workshop was the establishment of a golden scoring standard for the QPE by reaching consensus between all expert that were present at the QPE workshop. The workshop also set a ground basis for validation processes of the QPE in other languages.

The workshop was attended by a large variety of researchers from different countries and different scientific fields. This facilitated an exchange of observations and hypotheses between different medical specialties, and, thus, a transdiagnostic approach to the subject, which became especially clear during the plenary lectures. Each of these lectures represented a different point of view to the topic, and each of them was followed by an extensive and constructive discussion, in which hypotheses from different fields were exchanged and newly applied to the presented phenomena. A similar process occurred during the working groups, in which the topic 'hallucination assessment' was approached. Again, the presence of several different points of view within one group resulted in a spontaneous discussion on hallucinations across diagnoses, the overlap and differences in their phenomenology, and mechanisms that potentially underlie them. These are the topics and discussions that we would like to facilitate with a transdiagnostic instrument such as the QPE, so it was very fruitful for it to occur spontaneously during this workshop.

A striking finding was that scoring of the golden standard led to more discrepancies than we expected, especially within the subscale on delusions. These discrepancies might be representative for administration in general and allow us to anticipate more actively to them.

Format of the workshop and future suggestions

The format that was suggested by the Lorentz center has largely contributed to the success of the workshop. The alternation between plenary sessions and working groups facilitated a high level of interactivity and intellectual exchange. This was further enhanced by the extensive social program, in particular the evening dinner on the boat, which provided the opportunity for participants from different countries, fields and research positions to interact with one another. We are very grateful to the Lorentz center for offering this unique opportunity.

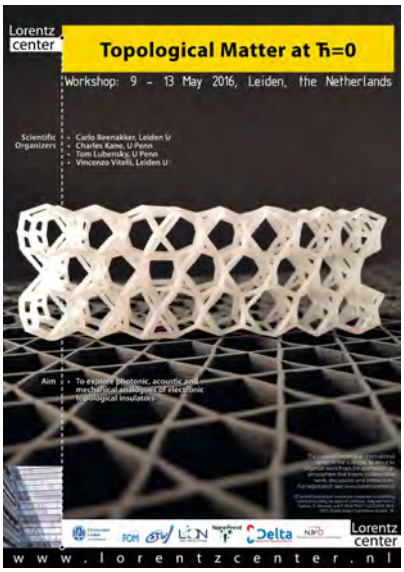
If anything, we would suggest to mention logistic limitations (such as restaurant closing times) clearly in advance. In that way, the organizing team is able to anticipate to these limitations and thus secure the course of the workshop, without having to interrupt an important lecture or discussion.

Mascha Linszen (Utrecht, Netherlands)
Maya Schutte (Utrecht, Netherlands)
Iris Sommer (Utrecht, Netherlands)

Topological Matter at ħ=0

Acoustic, mechanical and optical analogues of topological insulators

9 - 13 May 2016 @Oort



Scope of the workshop

Creating artificial materials that manipulate the flow of electrons, photons, sound waves or mechanical energy is a prime focus of modern materials science. In the past few years, a new paradigm is emerging within this effort thanks to the application of ideas from topology - the mathematics describing properties that are unchanged by smooth deformations.
Following an explosion of activity in the study of topological phases in hard condensed matter, this topological approach has recently made its way from the quantum realm of electrons to the classical world of light, sound, and mechanics. Common to all these developments is the presence of robust edge states, not necessarily linear waves, that owe their existence to integer-valued quantities (topological invariants) characterizing the bulk of the system.

Topological states have been demonstrated in three types of classical systems, involving waves of light (photonics), linear and non-linear sound waves in continuous media (acoustics), zero-energy modes of deformations and failure modes in mechanical systems. The Lorentz Center workshop has brought together for the first time scientists from all three communities creating a true synergy between different approaches to designing topological metamaterials. The program featured contributions of theoretical and experimental physicists as well as engineers reflecting the healthy balance between abstract and technology driven approaches that characterizes this emergent community that the workshop has helped to forge.

Scientific highlights

Among the scientific highlights of the workshop we note several proposals and preliminary experimental results for creating optical and mechanical metamaterials with artificial Landau levels that mimic some of the properties of quantum Hall systems in a completely classical set-up. A theme that has emerged in both optical and mechanical contexts is the need of developing flexible mathematical models that account for nonlinearities. In mechanics, several examples of topological metamaterials have been proposed whose theoretical description in real space relies on strongly non-linear field theories with a topological boundary term needed to capture zero modes or states of self-stress coupled to domain walls or dislocations. In the workshop several contributions have highlighted the special role that Guest modes and Weyl points play in nearly isostatic systems. Of special interest was the presentation of prototypes of geared topological mechanical metamaterials that go beyond central force networks. These systems display all the features of topological metamaterials and yet they are mechanically stable.
An important theme that has emerged from the onset is the role of disorder in topological metamaterials. Several contributors have stressed how the calculation of topological invariants like the Chern number (and the resulting chiral edge modes) can be performed in real space on disordered systems bypassing band structure calculations. A very impressive application of these ideas was the presentation of prototypes of gyroscopic metamaterials with unidirectional topologically protected acoustic waveguides at the edge.

A very intriguing arena that emerged on the workshop is the possibility to build classical Chern insulators using active liquids that flow spontaneously without external drive in confined geometries. The active flow generates by self-assembly a synthetic gauge field that breaks time-reversal symmetry and gives rise to topologically protected chiral density waves at the edge. Preliminary experimental evidence of such topological active metamaterials powered by active colloidal rollers has been presented at the workshop.

We have also witnessed the emergence of topological optomechanics that holds great promise for manufacturing nanomechanical devices that take advantage of the principle of topological protection. While in its infancy this field literally integrates optics and mechanics and it is a quintessential manifestation of the type of synergy that the workshop has fostered.

General comments

The presence of the two founders of the field of topological optomechanics, Lorentz professor Charles Kane and Tom Lubensky, greatly helped to attract the most active senior researchers, and we presume it also explains the great interest from junior researchers. Both Kane and Lubensky were at the Lorentz Center two years ago, when a small workshop at the Snellius venue basically started the whole field. All were amazed at how the field had exploded, and were happy to be back at the Lorentz Center for a full-scale workshop to report on this rapid development. This is really a field that owes much to the Lorentz Center!

Carlo Beenakker (Leiden, The Netherlands)
Charles Kane (Philadelphia, PA, USA)
Tom Lubensky (Philadelphia, PA, USA)
Vincenzo Vitelli (Leiden, The Netherlands)

The Morality of Inequality

An Interdisciplinary Perspective on How to Make a Difference

9 - 13 May 2016 @Snellius

Description and aims

Many contemporary problems relate to inequality between (groups of) individuals in society. Standard analyses focus on individual level and instrumental factors to explain and resolve social inequality. In the workshop we explored the added value of a group-level analysis taking into account moral concerns, by examining whether this improves our understanding of unequal outcomes relating to:

- health,
- education and work,
- migration,
- the environment

Outcome

The aim of the workshop was to prepare a volume of essays developing our theoretical perspective and considering how this may help explain and find new solutions for societal inequality in four domains. During the workshop we actually produced text, tables, statistics, illustrations and references to go into this volume. We presented this in the form of a book proposal by the end of the week to Amsterdam University Press, who has agreed to publish and distribute this volume. We will deliver the full manuscript by September 2016.

Scientific developments and Aha-insights

We developed a different type of analysis to understand the mechanisms that induce and maintain social inequality, by incorporating insights from multiple relevant disciplines, and applies this to four pressing societal issues.

"Aha" moments were contained in noticing the convergence and complementarity of insights developed in different disciplines.

Format

The format we used (preparing parts of a manuscript during the workshop) was new - also to us, and intense, but it worked well, and gave us a concrete goal to structure the activities and discussions. We interspersed plenary discussions and brainstorms with focused work in subgroups.

Other comments

Practical issues, support and facilities were excellent!

Belle Derks (Utrecht, the Netherlands)
Naomi Ellemers (Utrecht, the Netherlands)
Luara Ferracioli (Amsterdam, the Netherlands)
Frank Hindriks (Groningen, the Netherlands)
Daan Scheepers (Leiden, the Netherlands)
Félice van Nunspeet (Leiden, the Netherlands)
Jojanneke van der Toorn (Leiden, the Netherlands)

Fractality and Fractionality

17 - 20 May 2016 @Oort

At the Lorentz Center from May 17 until May 20, 2016, the Workshop on Fractality and Fractionality has been held. The number of participants, about 60, reached the maximum capacity of the Lorentz Center. The organization was forced to turn down many more applications for attendance. The organization was very pleased with the large interest from participants abroad, almost all, that confirmed the intended international character of the workshop. Another positive element was the large participation of young researchers.

The scientific program consisted of 29 plenary lectures (many of them by invited speakers) and 6 discussion sessions (pairwise in parallel) devoted to selected research topics. Next to the lectures and organized discussion sessions, the program offered ample time for informal discussions, also stimulated by the organizers through long lunch breaks, as well as shorter breaks between the lectures. These discussions also continued after the scheduled lectures, occasionally until after midnight in small groups. Certainly the excellent facilities of the Lorentz Center played an important role in the success of the workshop.

The workshop was concluded by a large 'round table' discussion session. Here a number of open problems to work on in the future have been posed. Participants have been invited to submit more open problems to the journal 'Modern Stochastics: Theory and Applications' with co-editors-in-chief K. Kubilius (participant of the workshop) and Yu. Mishura (organizer of the workshop). The same journal will also publish selected papers with a stochastic content related to the lectures in a special issue. Selected unpublished papers with an analytic content will be invited for publication in the journal 'Fractional Calculus and Applied Analysis' (editor-in-chief V. Kiryakova, participant of the workshop).

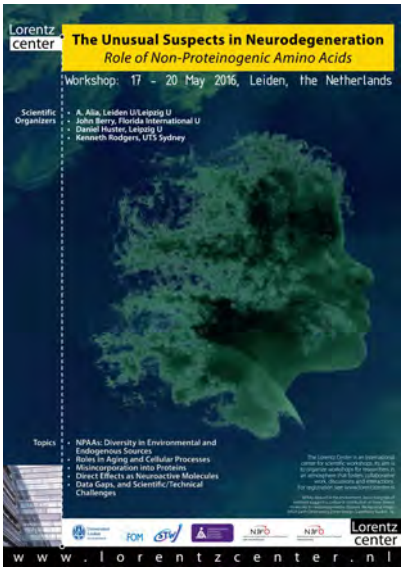
The organizers have received many very positive reactions by the participants during the workshop. The high scientific content of the program was praised, as well as the facilities of the Lorentz Center and the very helpful assistance by the staff.

Yuliya Mishura (Kyiv, Ukraine)
Georgiy Shevchenko (Kyiv, Ukraine)
Peter Spreij (Amsterdam, Netherlands)
Grygoriy Torbin (Kyiv, Ukraine)
Martina Zähle (Jena, Germany)

The Unusual Suspects in Neurodegeneration

Role of Non-Proteinogenic Amino Acids

17 - 20 May 2016 @Snellius



The workshop brought scientists working in diverse scientific fields including toxicology, analytical chemistry, molecular biology, biochemistry, biophysics and neurobiology together to explore the overlap between these approaches, and to accumulate knowledge, with respect to understanding the emerging role and possible mechanisms of NPAA toxicity in neurodegeneration. Around 19 scientists attended the workshop. Participants and speakers were both experts in their fields, as well as young scientists. The workshop was a great success. Several new contacts and collaborations were established, and these otherwise disparate communities significantly benefited, finding remarkably common interests and shared goals and opportunities, and are looking forward for future joint meetings. Proceedings of the workshop will be published as part of a special issue in the MDPI journal, Toxins, focused on the topic of NPAAs and neurodegeneration, as well as toxic amino acids more generally. In addition, review article summarizing the outcomes of this meeting is currently under preparation (to be featured in this special issue), and will serve as a basis for establishing a work plan, as well as foundation for a long-term consortium for future research collaboration, as well as possible funding opportunities.

Science

The aim of the workshop was to explore current evidences that non-proteinogenic amino acids (NPAAs), including both environmentally derived and endogenously formed representative, contribute to neurodegeneration. Although several lines of evidence support this notion, several remaining key questions were discussed during the workshop, including:

- how diverse and widespread are the NPAAs in the biological world;
- what are the main mechanisms whereby NPAAs may contribute to neurodegeneration;
- more generally, what is the current state of knowledge that supports a contribution of NPAAs to neurodegeneration?

The workshop triggered lively discussions, particularly as part of both scheduled discussion sessions, and open discussion during and following lecture presentations, and also stimulated potential for new collaborations. The diversity and fundamental role of the NPAAs were both critically discussed. With respect to the first question (i.e., "how diverse and widespread are NPAAs"), one important focus was conflicting reports on how widespread and abundant NPAAs are in the environment; although some previous reports have found them commonly among various sources, others suggest they are not as widespread, and likewise, the relevance of concentrations of NPAAs in the environment, relative to the levels required for toxicity and/or meaningful to neurodegenerative effects, remain unclear. Similarly, as to the second question (i.e., "what are the main mechanisms") although several studies have presented seemingly clear mechanisms of toxicity for NPAAs (e.g., misincorporation into proteins, and consequences thereof), considerable disagreement in this regard remains. Accordingly, one of the main outcomes was a questioning of the current state of knowledge, and need for rigorous and interdisciplinary collaboration to establish definitive information regarding both presence/abundance and mechanisms of NPAAs. The workshop, thereby, allowed discussion of how to exploit different techniques and expertise to address these lingering questions toward a unified picture of the contribution of NPAAs to neurodegeneration (or lack thereof). On this note, the consensus of

participants was that a second (and likely larger) follow-up workshop/symposium on the topic would be very useful; tentatively, the organizers and participants propose a workshop within 2 years, and specifically are targeting the larger (Oort) venue of the Lorentz Center for Spring 2018.

Although much of the workshop focused on the gaps and/or discrepancies in the current body of knowledge regarding NPAAs and neurodegeneration, and challenges and opportunities with respect to addressing these gaps/discrepancies, one presentation perhaps stands out as as potentially major contribution. A presentation by one of the young investigators (Upasana Roy) on the novel use of NMR-based methods for in vivo investigation of the effects of the otherwise well studied NPAAs, methylamino-L-alanine (BMAA), specifically in the zebrafish embryo as a model of development (including neuronal/CNS development). This study, and the results presented, gave an exciting "bird's eye view" of the effects of this NPAA, and possible glimpse at a unifying model of the neurodevelopmental toxicity of this particular compound, and additionally elucidated previously unseen effects on lipid metabolism as it potentially relates to neurodegeneration. As such it not only provided a potential breakthrough, it also perhaps qualifies as one of the "Aha moments" (as discussed below) in the workshop.

Most of the participants realized that the exchange between scientists of the diverse communities, and different approaches is very valuable, as many problems and ultimate targets are similar. That said, several aspects covered in the workshop arguably represented qualified moments of realization and/or clarity (i.e., "Aha moments") with respect to NPAAs and neurodegeneration owing to either fresh perspectives, or novel approaches which shed new light on the topic. Inclusion of experts in the field of protein translation (Dr. Ita Gruic-Solvaj and Dr. Mark Safro), and specifically aminoacyl tRNA synthetase - and associated proofreading mechanisms, etc. as it relates to fidelity of amino acid incorporation into proteins - provided an eye-opening view of the potential for non-canonical amino acids to be erroneously incorporated into proteins. Whereas most studies of NPAA have investigated toxic consequences in vitro and/or in cellular or animal, contributions by these experts in the fields of biochemistry/molecular biology elucidated the potential for a mechanism whereby NPAA may slip through tRNA charging/proofreading during translation, and be consequently misincorporated (as demonstrated in vitro, and in cellular systems). Likewise presentations, and associated discussion, on formation of, and methods to study, amyloid proteins/plaques (e.g., Dr. Martina Huber, Dr. Stefan Rossner) gave a clearly fundamental, but often overlooked, perspective on the potential for NPAAs to contribute to neurodegeneration. Similarly, presentation of results based on novel approaches, likewise, broadened the view of the potential for NPAA to contribute to neurodegeneration. As mentioned above, notable among these was a presentation on the use of NMR-based methods of in vivo evaluation of NPAA, and specifically metabolomics associated with BMAA exposure in the zebrafish. In addition, however, the inclusion of biophysicists (i.e., Dr. Daniel Huster, Alexander Korn) who have utilized a novel approach of synthesis, and subsequent analysis/modeling, of BMAA-containing amyloid beta peptides, likewise, provided a potential new route to investigate this proposed phenomenon.

Organization

The advice of the Lorentz Center was very helpful. In particular, we were suggested to give more room for free discussions, and for involvement of younger scientists. Both worked out very nicely. The one comment might be that, in our experience, some of the UNPLANNED "breakout" discussions were perhaps even more effective than the scheduling of discussion sessions, particularly perhaps when these sessions were scheduled at times later than presentations (when participants minds were more focused on the topic).
We are very thankful to the staff of the Lorentz Center for their expert handing of all administrative matters. The workshop was a joy to organize with such cheerfully reliable support. The meeting would not have been possible without the Center's generous financial support for which we are also most grateful.

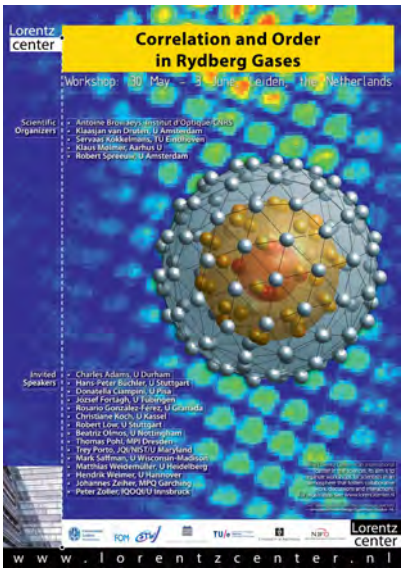
Proceedings of the workshop will be specifically featured as part of a special issue in the MDPI journal, Toxins, focused on the topic of NPAAs and neurodegeneration. This will include a review article, to be prepared collectively by several of the invited participants, that will serve as both an "executive summary" of the workshop, as well as comprehensive review of the state of the science. In addition,

it is very likely that several of the "invited" contributions this special issue will include previously unpublished relevant results from participants, and moreover, hopefully serve to attract other (who did not participate) to this topic.

A. Alia (Leiden University/Leipzig University)
John Berry (Miami, Florida)
Daniel Huster (Leipzig University)
Kenneth Rodger (University of Sydney)

Correlation and order in Rydberg gases

30 May - 3 June 2016 @Oort



This workshop concentrated on the features that distinguish Rydberg systems in the landscape of emerging implementations of quantum simulators. In particular we explored what problems in quantum simulation are particularly well suited to be addressed with Rydberg systems, especially in ordered systems, such as lattices of Rydberg atoms.

The structure of the regular sessions was roughly as follows. Sessions started by an introduction by the moderator of that session, usually followed by a long talk by an invited speaker, and a few shorter contributed talks. The role of the moderator was to lead the discussion and to actively stimulate it when necessary. We scheduled ample discussion time between the talks, and found that this worked quite well. In addition, session chairs were appointed mainly for time keeping. We found that having session chairs next to the moderators was not strictly necessary, because the moderators had the natural tendency to also take up the timing task.

In addition to these regular sessions, we organized parallel breakout discussions. During the workshop we identified several topics that would be worth discussing in a more informal session. Such topics were written down on the blackboard, and participants were asked to vote for one topic to see that all topics attracted sufficient attendance. The parallel groups discussed for about 1.5 hours. An appointed discussion leader reported back to the plenary meeting the next day. We received many positive comments about these parallel discussions from the participants, saying that this was very stimulating and made this workshop more than the standard conferences.

The scientific question of identifying problems amenable for Rydberg quantum simulation, points in the direction of soft-matter type systems on the one hand and spin systems on the other. Work towards those systems is progressing rapidly as reported in several stimulating contributions. This, and the direct discussions with leaders in the field has also generated several new and promising ideas for our own research that we had not considered previously and may also lead to possible future collaboration.

Our aim to have 20% attendance by female colleagues was indeed achieved with 11 female participants, who contributed actively with oral presentations, as moderators and session chairs. We were also satisfied with the good mix of senior vs. junior participants, as well as theorists vs. experimentalists.

Overall, we have received praise by many participants about the stimulating atmosphere at the workshop, as well as the facilities and organization offered by the Lorentz Center staff.

As the scientific organizers we look back at a very successful and stimulating workshop and are grateful to the Lorentz Center for their support.

Antoine Browaeys (Paris, France)
Klaasjan van Druten (Amsterdam, The Netherlands)
Servaas Kokkelmans (Eindhoven, The Netherlands)
Klaus Mølmer (Aarhus, Denmark)
Robert Spreeuw (Amsterdam, The Netherlands)

Combining Aperiodic Order with Structural Disorder

30 May - 3 June 2016 @Snellius

Aperiodic order, which includes the mathematical theory of quasicrystals, is a young field of considerable scientific interest that gained enormous impetus in recent years. Its significance was highlighted by the 2011 Nobel Prize in Chemistry to D. Schechtman for the discovery of quasicrystals. Aperiodic order typically is identified by properties of the observed points (Bragg peaks) in the observed (diffraction) spectrum. Such points indicate the presence of some kind of order. E.g. Schechtman's original discovery was triggered by observing a fivefold symmetry in the observed set of Bragg peaks, which is incompatible with periodicity. The relation between (diffraction) spectra and the structures causing them has raised a large number of questions. Although the theory of systems with pure point spectrum is quite advanced, the presence of a continuous part in the spectrum, due for example to the presence of deterministic, random or thermal disorder, as well as the relationships between diffraction spectra and dynamical spectra in this context, raise many so far unanswered questions.

In the workshop, some 25 scientists interested in and working on the topic of aperiodic order and perturbations thereof came together. In particular, experts from the different communities of Statistical mechanics, probability theory, ergodic theory and aperiodic order participated.

Topics of discussion included substitution systems and their properties as well as regular versus weak model sets and their connections with dynamical systems of number-theoretic origin. Of particular recent interest is the study of B-free systems, which admit a nice the reformulation in terms of weak model sets. In this context, also the Eberlein decomposition of weakly almost periodic measures and its meaning for the spectral decomposition of diffraction measures was discussed, which seems particularly relevant for the analysis of systems with disorder.

Another stream of discussions revolved around stochastic and thermal perturbations of aperiodic systems, their spectra, and the existence and construction of aperiodic Gibbs measures. For example, some fascinating new constructions of aperiodic Gibbs measures based on the connection between probabilistic cellular automata and Gibbs measures on space-time were presented, making either use of an embedding of continuous rotations in discrete-spin systems, or of the hierarchical constructions of two-dimensional probabilistic cellular automata with phase transitions.

Lectures were given by M. Birkner (Mainz), M. Dekking (Delft), F. Gähler (Bielefeld), C. Huck (Bielefeld), M. Keane (Delft), G. Keller (Erlangen), C. Kulske (Bochum), M. Lemanczyk (Torun), D. Lenz (Jena), J. Miekisz (Warsaw), R.V. Moody (Victoria), C. Richard (Erlangen), E.A. Robinson (Washington D.C.), N. Strungaru (Peterborough/Edmonton), S. Taati (Leiden), and R. Yassawi (Peterborough/Paris).

Equally important were the discussions among the participants, which occupied all spatial resources of the Lorentz Center. In fact, the mutual and strongly mixing interactions were one of the strongest assets of the meeting, and showed that the topic was very timely.
A number of new developments as well as old and new problems were discussed, in formal and informal discussions during the workshop, in which also new connections were made and a variety of collaborations pursued. The overall spirit of the meeting was that of mutual curiosity and intensive interaction, which will no doubt lead to a considerable number of new results and publications in the near future.

Aernout van Enter (Leiden, Netherlands)
Michael Baake (Bielefeld, Germany)
Holger Koster (Bielefeld, Germandy)

Decarbonized Futures

Narrating Low Carbon Societies

6 - 10 June 2016 @Oort

Introduction & Workshop Aims

For a quarter of a century, the problem of mitigating climate change has been portrayed as a matter of pollution control: of reducing the level of greenhouse gases emitted to the atmosphere at the "end of pipe" (Shaw 2011). This view is now giving way to recognition that fundamental transformations are required in order to decarbonize society: to radically reduce the input of carbon into our economies (SEPA 2012; Sachs and Tubiana 2014). Grappling with this challenge requires not only action in the present but also that we think of the future in different terms. A range of techniques are being developed to this end - from modelling and scenario techniques, cultural interventions, forms of experimentation and demonstration projects, as well as the development of specific low carbon pathways. While diverse in their aims, they all rely on forms of narrative: of telling compelling stories about the nature of the low carbon future and the means through which it can (and cannot) be achieved.

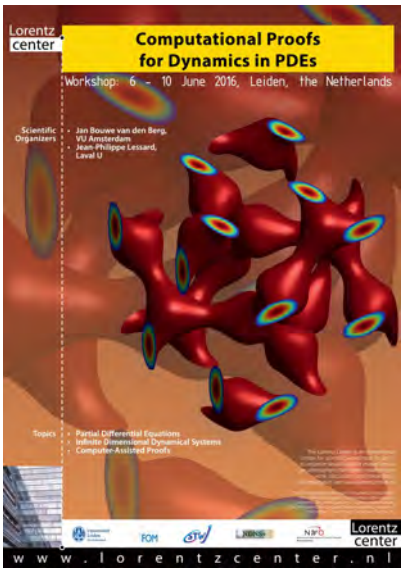
The aim of the Decarbonizing Futures workshop was to create a forum through which to activate a new conversation about the potential and limitations of these techniques as a means through which to catalyze the forms of political, economic and social response required decarbonization. The development and use of such techniques is now rapidly multiplying in a context where society seeks both to intensify the process of negotiating and delivering international climate change agreements and to establish alternative arenas for governing decarbonization, from the action plans of cities to efforts to decarbonize whole sectors of the economy. Yet to date the comparative and collective contribution in terms of how low carbon societies could be imagined or their impact on the political processes through which low carbon transitions might be achieved has not been bought into focus.

Such a dialogue is now required in order that the potential for new thinking about how to achieve low carbon transitions can be realized and the tensions and discord between different approaches considered. The Decarbonized Futures workshop drew together those involved in the practice of these techniques - modelers, scenario developers, artists, curators, policy practitioners - with those engaged in their assessment and critique from across a range of disciplines, including political science, public policy, innovation studies, geography, science and technology studies, socio-technical transition studies, sociology, economics and the engineering sciences. Through a series of interactive forums, including immersion in the spaces and stories of low carbon futures, expert talks, open space dialogues and a design-studio process, the workshop enabled a new understanding of the commonalities, strengths, limitations and conflicts between these approaches and how we tell stories about a future decarbonized world.
This brief report outlines some of aims of the workshop and reflects upon the wide range of methods that was deployed to reach those aims during the. The report also contains reflections regarding the content and the processes encountered by the participants.

Harriet Bulkeley (Durham, United Kingdom)
Maarten Hajer (Utrecht, the Netherlands)
Rob Raven (Utrecht, the Netherlands)
Janet Stewart (Durham, United Kingdom)
Johannes Stripple (Lund, Sweden)

Computational Proofs for Dynamics in PDEs

6 - 10 June 2016 @Snellius



Description and aims

The past decade has seen enormous advances in the development of rigorously verified computing. For questions related to nonlinear dynamics the most significant results are associated with finite dimensional systems. In this workshop we explored the challenges that lie ahead in applying these techniques to fully fledged problems in the theory of infinite dimensional nonlinear dynamical systems, with a particular emphasis on nonlinear partial differential equations.

Beforehand, we declared that we would consider the workshop successful if we compiled a list of challenging problems, developed initial ideas for solving these, and started new collaborations to examine them further.

Format

The workshop had a very limited number of lectures: four on the first day to set the stage, but only one plenary lecture on each of the following days. On the first day we had two lectures on the state-of-the-art of computer-assisted proofs in dynamical systems, as well as two lectures dedicated to formulating challenging PDE problems. Afterwards we had a plenary discussion about the problems we wanted to work on during the week. This list was revisited every subsequent day of the workshop. The rest of the week we broke up into groups to collaborate on these problems and then reported back to all participants about progress. Each day we also had a plenary lecture where another type of open problem was discussed, which led to amendments of open-problems list. Throughout the week we had several smaller time slots for spontaneous lectures, and indeed one or two of these were used every day. Additionally, on Tuesday, all PhD students gave short presentations to introduce themselves and their research.

Scientific developments and Aha-insights

The format of the workshop was very beneficial for achieving these aims. In particular:

- We generalized the existing methods from polynomial vector fields to general vector field.
- We identified a startup problem in the field of stochastic differential equations, with a link to finite element methods.
- We discussed how to prove existence and smoothness of invariant tori.
- We identified fully nonlinear reaction-diffusion problems (with cross-diffusion) that seem challenging but achievable.
- We discussed several concrete radially symmetric PDE problems which are currently just beyond the scope of existing methods, and we started working on them.
- We pinpointed Kolmogorov flow as a natural starting point for investigating the applicability of the computer-assisted proof methods to the Navier-Stokes equations.
- We made significant progress on applications to delay equations.

After the workshop we received a lot of positive feedback, especially from the participants who were relative outsider: they remarked that this type of hands-on workshop introduced them much better to the field than a regular "talks-based" workshop would have done.

Jan Bouwe van den Berg (Amsterdam, the Netherlands)
Jean-Philippe Lessard (Québec, Canada)

Pathways to Solar Hydrogen Technologies

13 - 17 June 2016 @Oort

Science

During one week, the workshop Pathways for Solar Hydrogen Technologies focused on scientific, economical and societal aspects of the production of solar hydrogen. Each day we discussed in detail specific aspects of solar water-splitting devices, including materials' development, component integration, device engineering, potential industrial applications, and broader societal impact of these types of technologies. Particular attention was given to identifying the hurdles that currently prevent the sustainable production of hydrogen via photoelectrochemical routes, and a roadmap was developed identifying short-term and long-term opportunities, and challenges for the deployment of the technology.

As a result of the discussions, a unified position was reached on technical areas of research that could positively impact the viability of solar hydrogen generators. Also, a roadmap identifying potential routes to bring lab-based technologies to the market (i.e. early-stage niche markets as well as long-term energy markets) was developed. It is our intention to publically disseminate this position in the form of multiple publications, one geared toward the scientific community and another written for the general public. Additionally, the journal Energy and Environmental Science sponsored three poster prizes for Ph.D. students that attended our workshop and the recipients were Lai-Hung Lai (AMOLF, The Netherlands), Timothy Rosser (University of Cambridge, UK), and Pieter Westerik (University of Twente, The Netherlands).

A concise vision and roadmap moving forward in scientific research and development for practical means to implementing solar H2 technology was identified. This consensus is not common among such a large cohort of experts in this field, and therefore we think this is a success.

An eye-opening moment for many was the realization that the economic challenges to bring these technologies to the energy markets appear to be insurmountable in the medium term. This is due to the fact that the production cost of solar hydrogen will need to be reduced below the level of the cost of hydrogen production from fossil fuels (currently at <USD 2/kg of H2 in the U.S.A.). Based on our current understanding of solar hydrogen technologies, and even considering foreseeable advances in the future, the group believed this target to be unreachable by photoelectrochemical water-splitting devices in the short and medium terms (10+ years).

Organization/Format

The workshop brought together 52 participants representing Asia, USA, and Europe, as well as the academic, industrial, and governmental sector. It seems that most found it important to discuss the challenges that need to be overcome to allow implementation of current laboratory-based technologies on a large scale. To break the routine with conventional conferences and workshops, we asked the speakers (3 to 4) of each morning to include a few questions, or to give a general direction in their assigned topic within their 20 min talks. Moreover, we asked them not to focus on their own research activities, but to look at and assess the challenges from a broader community-wide perspective. This was used as an initiator for discussion after each talk. The afternoon sessions comprised small group discussions that were chaired by two young researchers, which also received some guidelines, but had the freedom to include their own points of view.

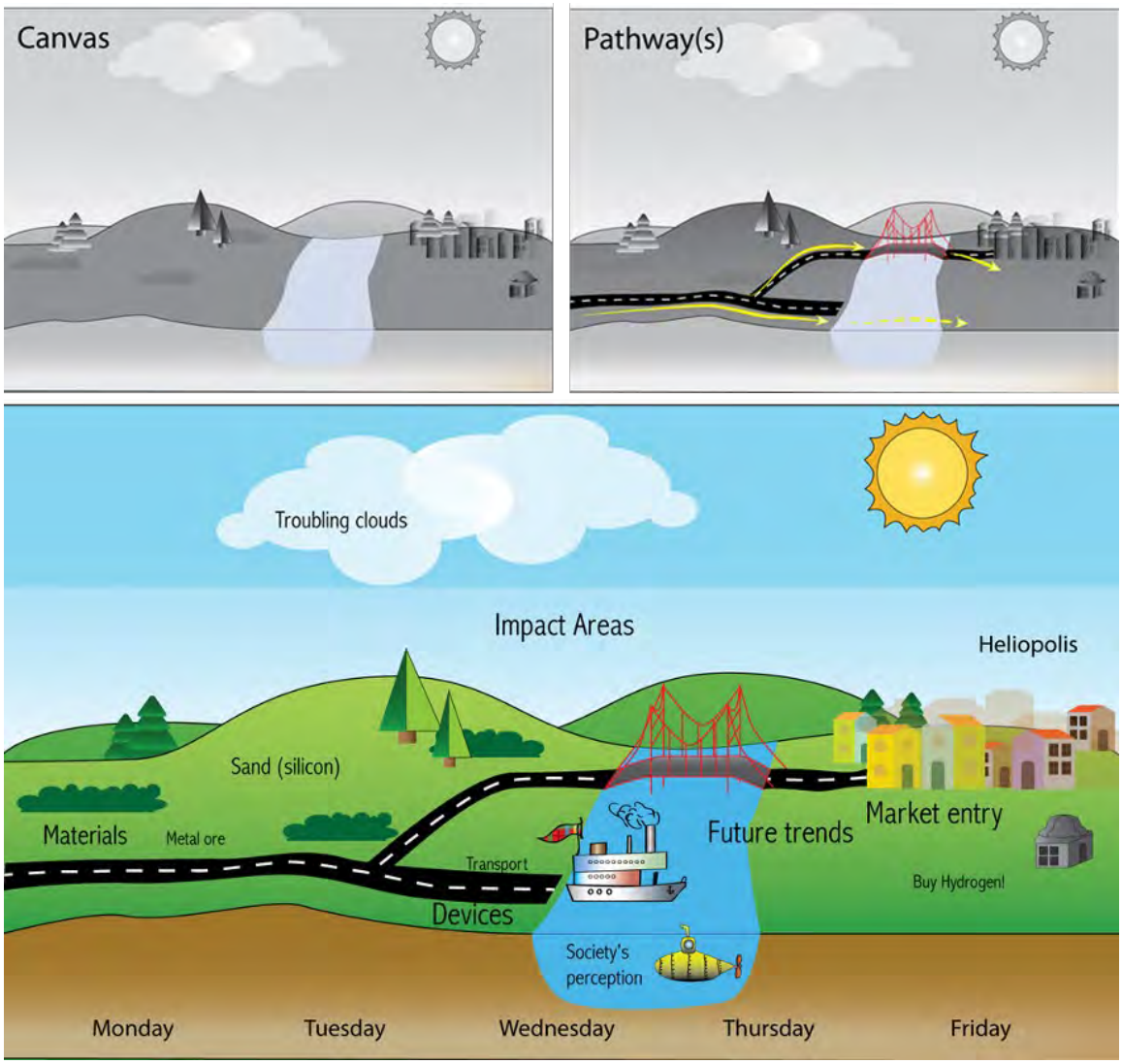
The topics of the talks included state-of-the-art and materials challenges at laboratory scale, device engineering aspects, current industrial applications, and governmental and societal perspectives of

solar hydrogen within the future energy landscape. During the discussion sessions the participants were asked to evaluate challenges faced by particular device architectures such as PV+electrolysis, photoelectrochemical cells, and particle-based suspension reactors. On the policy and market end, the participants debated about the role of solar hydrogen technologies in future scenarios where science and energy policy are driven either by the free market or by governmental policy. Also important, the participants contributed with their ideas of what are the earliest marketable examples of solar hydrogen technologies, and the advances necessary to bring solar hydrogen devices closer to market viability in the energy sector.

Other comments

It seems that all the participants were impressed by the quality of the facilities, logistics, and accommodation provided by the Lorentz Center. As first-time organizers, our expectations were exceeded and we look forward to future event organization experiences.

In the following chart we illustrate how we envisaged the process of the whole workshop.



Shane Ardo (Irvine, CA, USA)
David Fernandez Rivas (Enschede, The Netherlands)
Miguel Modestino (Lausanne, Switzerland)
Verena Stimberg (Enschede, The Netherlands)

A Cosmic Census of the Galaxy Populations in the Distant Universe

20 - 24 June 2016 @Oort

Description and aims

Understanding the evolution of galaxies across cosmic time is one of the great challenges of astrophysics. Current observations and theories have significant uncertainties in e.g. the feedback processes that influence star formation and the way in which the demographics of galaxy populations and their evolution depend on their environments. To make progress, we need to map well-defined samples of galaxies in statistically representative range of environments using telescopes that probe different physical processes. These observations provide statistical constraints on models of galaxy formation in which the star-formation, stellar mass and accretion activity in galaxies of galaxies are tied to the history of the dark matter halos in which they reside. Rare populations of galaxies also provide sensitive tests of the extremes of such models.

To address these topics many ambitious survey programs (covering a few, tens, hundreds or thousands plus square degrees) have recently been carried out, or are currently underway, at the major astronomical observatories, e.g. VISTA, LOFAR, Herschel etc. The Herschel Extragalactic Legacy Project (HELP), funded by the European Commission Research Executive Agency, aims to "help" by bringing together these various projects.

The foundation of HELP is 1300 deg2 of data from the European Space Agency's (ESA) Herschel space mission. Exploration of the star formation history of the universe, using extragalactic surveys, was a major goal of the Herschel mission. By combining the data from many observatories, utilizing advanced statistical techniques and developing new tools HELP intends to overcome the limits of Herschel resolution and enable astronomers in Europe to realize Herschel's full potential.

HELP will create a multi-wavelength, homogenous, photometric resource covering ~1300 deg2, with added-value in the form of photometric redshifts and physical modeling of e.g. stellar mass, dust masses and star-formation rates.

Our workshop was timed for the midpoint of the HELP project. It brought together for the first time the European scientists who were expected to be key beneficiaries of HELP, with members of the international multi-wavelength survey teams (including LOFAR) and the core HELP team. Through direct interaction between the HELP team and the users, the science exploitation was able to begin in earnest. HELP could also get feedback and make adjustments to future direction of project, so that final data products and tools have the greatest legacy value possible. Furthermore, the key tools and data products enabling European astronomers to understand the growth of galaxies across the history of the Universe would be provided.

The key objectives were to:

- Explore the scientific questions that these multi-wavelength datasets seek to address;
- Review the available, ongoing and planned datasets and assess the needs for new observations;
- Assess the progress on the technical challenges e.g. in photometric redshifts, dealing with selection functions and resolving the Herschel confusion challenge;
- Compare and asses the methods for modelling the intrinsic physical properties of galaxies from their observed photometric properties;
- Critically assess the tools and delivery of data to best meet the needs of the community in addressing the scientific questions.

Organization and format

The workshop exploited different formats. There were some standard review/invited level talks, a few shorter contributed talks, moderated discussion and breakout sessions and "hack sessions" with demonstrations of software tools and short tasks and a final "hack day" where participants tried to achieve their own objectives using tools provided.
The moderated discussion sessions and breakout sessions were extremely valuable. There was lots of very active and healthy discussion on many different topics and issues were raised, thrashed about and plans formed.

The hack sessions/hack days were a new concept for many participants and relatively new for the organizers. They were useful in introducing participants to the new software. However, they were not as successful as we'd hoped. We think they have great potential but in future we believe the participants need to be given more information in advance of the meeting to be better prepared and we need more trained facilitators to get people working more quickly.
The review talks were very useful to get everyone "on the same page". There were probably too many review talks and we could have removed the contributed talks to give more space for discussion and working sessions.

Scientific developments

This meeting brought together extragalactic astronomers studying galaxy evolution using surveys with many telescopes. It was lead from the Herschel Extragalactic Legacy Project (HELP) and was intended to share with the wider community what that project was doing, to learn from the community what the priorities should be and to develop collaborations to take this forward.

We had breakout sessions on: galaxy environments, high redshift galaxies, galaxy lensing systems, population modelling, photometry, photometric redshifts, galaxy quenching, spectral energy distributions modelling, star formation and AGN connections, luminosity functions and Bayesian statistical methodologies.

Various new data sets were released to the participants during the meeting, including the COSMOS data, new Herschel HerMES and HATLAS data and Herschel photometry in COSMOS field using the new HELP xid+ methods.

Highlights included the discussions on: database visualisation, photometric modelling methods, Active Galactic Nuclei (AGN), and luminosity functions and clustering. The visualisation discussions explored how the complex data in these fields could be represented to users, and clearly articulated a challenge, if not yet the solution! The discussions on photometric modelling methods introduced different teams to each other approaches and clarified the differences, new ways forward were discussed and collaborations appeared to be emerging. The challenge of AGN in these multiwavelength data sets was recognised and collaborations formed to help address these within HELP. A strong group formed around the topic of exploiting the HELP data to understand luminosity functions and clustering and this group have been meeting to discuss this topic since.

Veronique Buat (Marseille, France)
Seb Oliver (Sussex, United Kingdom)
Huub Röttgering (Leiden, the Netherlands)
Louise Winters (Sussex, United Kingdom)

Children Seen and Heard Across the Globe

20 - 24 June 2016 @Snellius

This workshop was a follow-up of the NIAS workshop Children seen and heard across the globe that took place in Wassenaar in 2015 and aimed to create an interdisciplinary network of scholars using video observations to study child development in communities in non-Western countries. The Lorentz workshop's aims were to: (a) Analyze the video data from a pilot study that was designed in 2015; (b) Use these analyses to formulate a grant proposal for a larger cross-cultural multidisciplinary study; (c) Start collaborative papers on the existing video data sets available to participants.

All participants have expressed commitment to contributing to a grant proposal to be submitted to the Welcome Trust (UK), and which will focus on the cultural, linguistic and social-emotional context of child development across countries. The proposal is currently being written. Further, several small-group collaborations have been formed, with new data collections now underway for several of these projects (such as one on grandparental caregiving in Zambia, Chile, and Iran). In addition, two collaborative papers have been finalized, one of which has now been accepted for publication (in Child Development), and one that is under review (second round).

The fact that the workshop was attended by 24 scholars from 17 countries from all over the world can be considered a scientific breakthrough. The study of child development has rarely (or maybe even never) been discussed by such a multicultural and multidisciplinary group of researchers. Several methodologies that are widely used in Western populations proved to be unfit for cross-cultural use and needed substantial adaptation. Similarly, it was clear that every video that was presented by participants provided new important insights precisely because of substantial cross-cultural variations in customs and circumstances that forced the group to consider alterative methodologies to capture this variation. Universals were also noted. The discovery that caregiver sensitive responsiveness to infant signals was observed in all contexts, even though the behavioral manifestations of such responsiveness varied, was experienced as an aha moment.

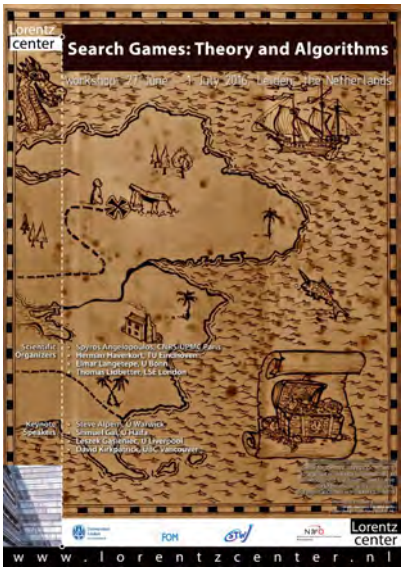
The format, consisting of a loosely planned program with a mix of plenary presentations and discussions, and small-group meetings to form concrete collaborations, was experienced as very helpful to the process. Because the program was flexible, the group had the freedom to elaborate on issues that came up during discussions without having to rush, and to add things to the program for the next day. A new element for most of the participants was the Socratic discussion about ethics led by an external speaker. This was a surprising and inspiring part of the workshop that really contributed to the depth of our discussions about our work.

Heather Brookes (Cape Town, South Africa)
Judi Mesman (Leiden, Netherlands)
Akira Takada (Kyoto, Japan)

Search Games

Theory and Algorithms

27 June - 1 July 2016 @Oort



The main aim of the workshop was to bring together researchers from the community of mathematics/operations research (OR) and the community of theoretical computer science/algorithms (TCS) within the context of search games. Traditionally, in OR, exact, mathematical solutions to the studied problems are sought, and computational considerations are often secondary. In contrast, in TCS, the emphasis is on the computational and algorithmic aspects of the problems. Our objective was to expose the participants to recent progress in both approaches, and to identify some directions for future work that are worth a combined approach.

While the workshop was not meant to deliver a concrete "tangible" outcome, it is worth pointing out that all invited speakers gave well-received presentations, and that we had quite long sessions of open problems as well as discussions on progress of the work groups on said problems, at the end of the week. There was a very satisfactory level of contribution from the invitees in all main sessions. More specifically, the participants reported about 10 main directions/ problems that were studied by various groups during the workshop, and that looked promising for further future work. We have kept notes of these groups and their research topics.

Similarly, while we cannot claim any major "scientific breakthrough" within the limited time of the workshop, judging by the participation level of the attendees, we are confident that some of the started collaborations will lead to publications in the future. It should be emphasized that some of the senior participants noted that the topic of the workshop was significant enough to warrant a regular series (e.g., at an annual level) of similar workshops, as often organized in TCS/OR for other fields (e.g., scheduling).

There were certainly quite a few moments during which the participants realized overlaps with seemingly unrelated areas. For instance, our participants noted that the area of geometric random graphs shares similar tools and similar intuition with some of the search games. Similar observations were made for patrolling games and the fields of scheduling and temporal networks.

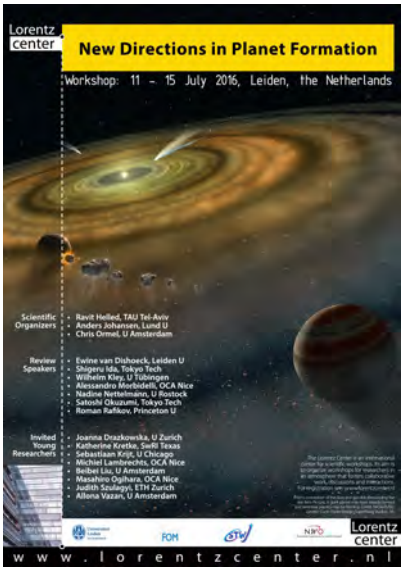
We chose a format with four invited (long) lectures and several shorter contributions. We also had an open problem session, a session on discussion and report of progress, as well as a session on broader future directions. We are happy to report that we noticed many interactions between the two groups during the workshop, both during the talks and during the breaks. We believe that the fact that the program was not overloaded with talks, as well as the overall quality and variety of the participants were conducive to the natural interaction between the participants, and the creation of several informal study groups. There were no cancellations of talks in the preliminary program.

We are very satisfied, and indeed impressed with the support we received from the Lorentz center and its staff. We appreciated that the participants were given ample office space, and that we could share facilities such as the common room with the staff. This created a very hospitable atmosphere which we believe made the participants feel very welcome. One suggestion we would offer for future workshops is to ask the participants to fill in an anonymous feedback questionnaire.

Spyros Angelopoulos (Paris, France)
Herman Haverkort (Eindhoven, The Netherlands)
Elmar Langetepe (Bonn, Germany)
Thomas Lidbetter (London, United Kingdom)

New Directions in Planet Formation

11 - 15 July 2016 @Oort



Description and aims

In organizing this workshop, we had several key goals in mind:

- Exchange of the latest results on planet formation topics, triggering future (collaborative) research
- Introducing planet formation experts to the Netherlands
- Introduce/entice younger people to planet formation topics and to the leading people in the field

Format

We planned to organize the workshop early 2014. To fulfill the goal we conceived a program that was strong both content-wise (presentations on the state-of-the-art) and left room for interaction by having a 3h break in the middle each day (and many other long breaks). We were very happy about this design. During the 3h breaks smaller groups tackled specific research problem. These groups were made up of senior (professors) as well as junior scientist (PhDs), but in the end it was the junior scientists who had to give the presentation. We believe this design paid off. Although not every group's research question is suited to provide a tangible result, at least one group, studying the likelihood to capture planets, considered submitting their work to a journal.

The open design of the workshop means not every of the around 50 participants could orally present their work. However, the 15 (mostly junior) participants that presented a poster had plenty of time to promote their work. We also were happy with the 1h plenary discussions, which were very lively.

Scientific developments and Aha-insights

The scientific highlights of the workshop were summarized by Chris Ormel at the close of the meeting. These new realizations include: the realization that initial conditions matter for disk evolution, the importance of icelines in explaining ALMA observations and triggering planet-formation instabilities, the connection between super-Earth planets and solar-system planets, the importance of constraining planet formation theories in binary systems. There is plenty of research to do.

To the best of our knowledge, this has been the first dedicated meeting on planet formation topics in the Netherlands. For some of the participants this had been their first visit to the Netherlands. Since it has become clear in recent years that disk science and planet formation science are intimately connected, this is a welcome development for the emergent exoplanet research in the Netherlands.

In summary, we look back on an exhaustive but very successful week!

Ravit Helled (Tel-Aviv, Israel)
Anders Johansen (Lund, Sweden)
Chris Ormel (Amsterdam, the Netherlands)

EMS-ESMTB Summer School

Mathematical Biology of Tissue Mechanics

25 - 29 July 2016 @Oort

Description and aim

The objective of this summer school was to bring together young researchers in the quantitative life sciences and teach them a range of mathematical approaches to analyze and model the biomechanics of tissues and the collective behavior of cells. The European Mathematical Society (EMS) and the European Society for Mathematical and Theoretical Biology (ESMTB) jointly organized the workshop, which fitted into a series of annual workshops on mathematical biology organized together with the EMS (http://www.esmtb.org/schools).
The school focused on hands-on group work, with participants focusing on one out of four biological problems, each of which was suggested by one of the speakers.

The projects were:

- Spatial effects in the pathogenesis of blood cancers, including leukemia, with mentors Anass Bouchnita, Alen Tosenberger and Vitaly Volpert, CNRS Lyon, France. The project focused on hybrid, cell-based models based on Lagrangian dynamics.
- Modelling pigment cell interactions in zebrafish skin patterns, mentored by Roeland Merks, CWI and U Leiden, The Netherlands, and Anna Marciniak-Czochra, U Heidelberg, Germany. Mathematical methods included cellular automata and partial-differential equations
- Modeling of planar cell polarity, mentored by Walter de Back and Andreas Deutsch (TU Dresden). Mathematical methods included reaction-diffusion systems and the Cellular Potts model
- Zebrafish epiboly and formation of compartments in 3D tissues: coupling mechanical behavior and gene regulation, mentored by Nadine Peyriéras, CNRS Gif-sur-Yvette, France, and René Doursat, Manchester Metropolitan University, UK. Mathematical methods included Lagrangian particle-based methods and data analysis.

Tangible outcomes

Each of the project teams has delivered a number of first, preliminary results, ranging from technical developments to new modeling insights. These will be described in more detail in an online, open access proceedings volume. Some of these proceedings articles will be considered as the "embryonic stages" of full journal articles; in addition, some developments in project D have been so useful that they will be included in ongoing work.

Organization/Format

The format of the workshop with 34 participants (9 mentors/25 students) was perhaps best described as a "Hackathon" rather than a traditional summer school. The mentors guided their teams in an off-hands manner, with the participants taking the lead in their research. The mornings started with group work (9:00-11:00) followed by a plenary lecture that showcased exemplary stories that have combined mathematical modeling and experimental biology, as well as discuss a number of mathematical methods in-depth. The afternoons were dedicated to group work, followed by plenary progress reports.

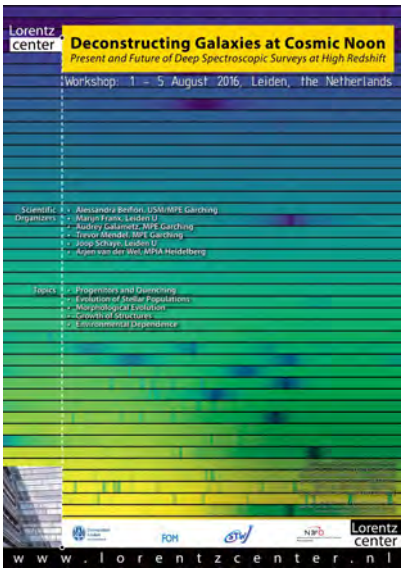
This format worked well, with small changes adopted throughout the week to ensure the availability of large blocks of 'free' working/discussion time. Organizers and mentors deliberately offered a large range of available mathematical and computational techniques, so as to increase the emphasis on problem solving instead of development of techniques. Opinions on this were mixed: Some participants appreciated the variety, whereas others would have preferred a larger focus on a selection of one or a few techniques. The participants very much appreciated the welcome party and the workshop dinner; some have proposed to move these events a bit during the week, as, e.g., the welcome party distracted a bit from the already intense discussions on Monday. We will write out an online survey to investigate these issues further, in particular because participants and mentors were so enthusiastic about the school, the format and the venue, that they would like to do it again.

Andreas Deutsch (Dresden, Germany)
Roeland Merks (Amsterdam, The Netherlands)
Vitaly Volpert (Villeurbanne, France)

Deconstructing Galaxies at Cosmic Noon

The Present and Future of Deep Spectroscopic Surveys at High Redshift

1 - 5 August 2016 @Oort



Description and aims

The latest generation of ground- and space-based imaging surveys have shown that quiescent galaxies evolve dramatically from z = 3-4 to the present, both in absolute number as well as average properties. While these surveys provide an unprecedented statistical view of the galaxy population, they raise a number of questions that are difficult to address using photometric data alone. With the development of efficient, multi-object optical and near-infrared spectrographs, it is now possible to directly probe this evolution by studying detailed galaxy properties - e.g., stellar and dynamical masses, star-formation rates, ages, star-formation histories, etc. - out to the highest redshifts.

Format

The schedule was organized so as to maximize interaction among participants, with small blocks of discussion time spread throughout each day to address immediate questions, and longer "curated" discussion sessions led by experts centered around 6 main topics: "Massive galaxies at high redshift", "Massive galaxy progenitors", "Galaxy assembly and growth", "Kinematics/dynamics of galaxies", "The impact of environment on galaxy evolution", and "Modeling galaxy properties". This format helped to maintain a feeling of ongoing discussion throughout the week, while at the same time allowing all participants to present their work. The majority of our participants were early-career researchers and PhD students, which helped to contribute to an extremely friendly, open, and productive atmosphere. In addition to these pre-planned discussions, the schedule included two free form "breakout" sessions, during which participants could work in small groups and delve more deeply into particular areas of interest. A list of possible topics was collected at the start of the workshop; these topics were used as starting points for the various breakout discussions. These sessions proved to be extremely productive, and we would recommend such breakout sessions to future workshop organizers as an excellent way to stimulate discussion.

Scientific developments and Aha-insights

This workshop brought together a diverse group of experts in order to discuss recent progress towards understanding the formation and evolution of massive, passive galaxies with a particular focus on the value added by spectroscopic data.

The main outcomes are summarized below:

- It is important not to over-interpret galaxy properties derived from, for example, color-color diagrams which are specifically designed to hide certain "nuisance" parameters like dust content. In nearly all cases, such analyses can be improved by including additional information such as the UV slopes, star-formation histories, etc.

- Multi-wavelength data is critical to robustly constrain galaxy properties. Especially at $z > 3$, where the majority of massive galaxies appear to be extremely dusty, independent estimates of the dust content and distribution from Balmer decrement, UV slope, and/or sub-mm data should be incorporated when possible.
- It is time to move past "simple" estimates of galaxy dynamical mass as a means to test stellar mass/size measurements at high redshift. It remains unclear how to self-consistently incorporate the most up-to-date information about the star-forming progenitor population into the analysis of passive galaxies.

The facilities provided by the Lorentz Center were excellent, and we would like to thank in particular Eline Pollaert, our workshop coordinator, for her support both before and during the workshop. We have received very positive feedback from all participants and would recommend the Lorentz Center to anyone else looking to organize a similar type of workshop.

Alessandra Beifiori (Garching, Germany)
Audrey Galametz (Garching, Germany)
Trevor Mendel (Garching, Germany)
Arjen van der Wel (Heidelberg, Germany)
Marijn Franx (Leiden, Netherlands)
Joop Schaye (Leiden, Netherlands)

High Energy Astrophysical Model Comparison

8 - 12 August 2016 @Snellius

With present and future planned upcoming high resolution X-ray spectroscopy missions, including Chandra, XMM-Newton, Hitomi and its planned successor mission, astronomers are able to observe X-ray spectra with unprecedented precision. While extensive efforts to cross calibrate the instruments themselves take place through the IACHEC consortium, there has so far been little similar work in comparing models which astronomers use to interpret these results. This workshop brought together people involved in many of the groups who maintain these models to compare their results.

During the meeting, we compared many different models and found some significant differences between the results expected from both. We have generated a standard format for comparison of results and generated these for each different database, with a commitment to maintain these results for future use. The reasons behind many of the discrepancies have been discovered, with more remaining to be explored. This work will continue into the future, but the infrastructure built here will be very useful in making such comparisons.

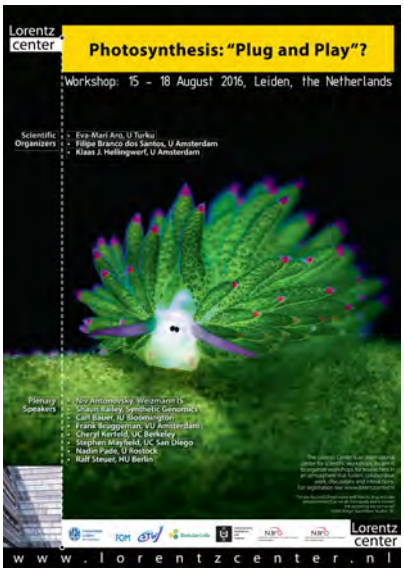
There were many experimentalists present as well, who shared expertise on what the quoted uncertainties on measurements actually mean. Particularly illuminating was a discussion of what calibration is used in experimental measurement of atomic physics data, and what can and cannot be trusted.

The Lorentz workshop format was particularly useful for this group, as we managed to break into small sections when necessary, bringing together teams from different atomic physics groups from within and outside astrophysics to compare models in a highly detailed way. We anticipate this group working together in the future to continue these analyses, and including more groups who were unable to attend this time.

Adam Foster (Cambridge, United States)
Jelle Kaastra (Utrecht, Netherlands)
Randall Smith (Cambridge, United States)

Photosynthesis: "Plug and play"?

15 - 18 August 2016 @Oort



Motivation and goal of the workshop

Sustainable development of our society requires a dramatic increase in the contribution of photosynthesis to the production of energy carriers and commodity materials, to remedy excessive current CO2 emission. To facilitate this transition it is necessary to engineer photosynthesis into a form in which relevant products are formed directly from CO2 and water. Such 'direct conversion' can be approached from opposite directions: (i) Engineering existing phototrophs and transforming them into efficient product-forming organisms, accompanied by genome reduction, and (ii) transferring the capacity to photosynthesize to chemotrophic cell factories, with the option to also engineer them to autotrophy. This latter way to tackle the problem is also referred to as a 'plug-and-play' approach.

All this requires a thorough knowledge about the minimal requirements for photosynthesis, with the complication that this process comes in at least 3 different forms: oxygenic photosynthesis, various forms of anoxygenic photosynthesis and retinal-based photosynthesis. Significantly, the most recent literature on increasing the efficiency of (oxygenic) photosynthesis proposes to mix the different types of photosynthesis, as well as CO2.

Participants and organization of the workshop

In total 48 participants from 12 different countries took part in the workshop, several of whom also participated in the Maastricht meeting on Photosynthesis, which was held in the week preceding this workshop. This participation ranged from the very junior master- and PhD students to (emeritus) professors, most from academia, but also with significant participation from industry. Amongst these were 11 plenary speakers, 10 invited speakers and participants. From the latter group 8 introduced their research project in a short talk in one of the plenary afternoon sessions and 6 presented a poster. Also one of the sponsoring companies gave a brief presentation of its field of activities.

The meeting was organized with two plenary- and one invited lecture in the morning session and one plenary-, one/two invited lectures, and on average three short presentations in the afternoons. All lectures were scheduled with ample time for discussions (which were led by the organizers and some of the invited speakers). Generally the lectures were of high quality and they were followed by lively discussions, with participants from all echelons. Many of the discussions spilled over into the coffee-, tea- and lunchbreaks. Accordingly, all types of photosynthesis, various forms of autotrophy, synthetic biology and metabolic modelling, and the plug & play approach versus genome reduction were all presented and explained at a high level and discussed with very broad participation. The organizers therefore consider this workshop as a success, even more because several new initiatives for collaboration (particularly inter-European) emerged among the younger participants. Several of the younger participants, after the meeting, expressed to me explicitly that they had learned a lot of this very interesting and stimulating scientific gathering.

Organizationally

The facilities for science, the social program, and the logistics for coffee-, tea-, lunch- and evening-breaks were organized in a very efficient and helpful way by the Lorentz staff. This has helped significantly to create the open and interactive atmosphere during the meeting. If I can mention one

small minus point, it is the uncertainty about the financial support from the Lorentz center: Had this been clearer from the beginning, it would have been possible to also invite one or two Asian colleagues, while the choice now was largely limited to plenary- and invited speakers from Europe and the US. Because of the generous support of the sponsors (particularly the universities of Turku and Amsterdam) in hindsight this broader geographical coverage would have been possible.

Eva-Mari Aro (Turku, Finland)
Filipe Branco dos Santos (Amsterdam, The Netherlands)
Klaas Hellingwerf (Amsterdam, The Netherlands)

Mathematical Structures for Cryptography

22 - 26 August 2016 @Oort

Description and aims

The goal of the workshop was to find new ways to use mathematical structures for cryptographic applications. Very successful existing examples of such mathematical structures are given by RSA and elliptic curves, which your browser uses nowadays to set up a secure connection with online banking and other web-based services. A promising recent example is the use of lattices in fully homomorphic encryption: a form of encryption where untrusted parties can compute properties of encrypted data without learning the content of the original data. This is becoming more and more important with the rise of online 'cloud' services.

Algebra, number theory and algebraic geometry have been a fertile source of suitable structures (RSA, lattices, elliptic curves, abelian varieties), and this workshop aims to bring together researchers from the cryptography and mathematics communities to work towards the goal mentioned above.

Format

In addition to talks by cryptographers and mathematicians, the workshop included ample time for informal discussion and interactions and open question sessions. This aspect seemed particularly successful, with many small groups forming to exchange or collaborate in the many offices provided by the Lorentz center, and several participants expressed their enthusiasm for this format.

The expectation for a wide variety of talks was also met, both in terms of topics than of format. Many tutorial talks were given which helped a lot each community (algebraists, number theorists, cryptographers) to understand the motivations and questions of the others. A few advanced lectures on recent research nevertheless showed the depth of the topics of this workshop.

Scientific developments

Considering the rather wide range of backgrounds of different participant, no 'great scientific breakthroughs' were expected for this workshop. Rather than developing one common goal, the workshop seems to have been successful at cultivating many shared research interests. For example, the open problem sessions were quite interactive, and some of those problems will for sure be "brought back home" by other participants to be solved.

Several deep mathematical talks were given, but always keeping alive the connection with cryptographic matters. In particular the design of algebraic curves well fitted for efficient implementation is still a lively and fertile topic, as well as progress in cryptanalysis on the discrete logarithm problem. But some new mathematical theories made their appearance with interesting cryptographic consequences, such as capacity theory.

The workshop was also successful in portraying the transition of interests of the cryptographic community to other mathematical objects, in particular to lattices, and algebraic number theory; a transition mostly motivated by the goal of designing cryptographic primitive that would resist quantum computing. But the tutorial talk (F. Vercauteren) on the recent SIDH proposal (Singular-Isogeny

Diffie-Hellman) has raised a lot of interest. It could be that algebraic geometry remains relevant in cryptography in a post-quantum world. This for sure will help to bring this scheme under the required scrutiny of experts.

Léo Ducas (Amsterdam, the Netherlands)
Hendrik Lenstra (Leiden, the Netherlands)
Alice Silverberg (Irvine, CA, USA)
Marco Streng (Leiden, the Netherlands)

Migrant (R)e-collections

22 - 26 August 2016 @Snellius

The Migrant (R)e-Collections workshop brought together international representatives from research, cultural heritage institutions, data scientists and the migrant communities.

It was centered on the possibilities of creating a migrant virtual heritage collection that goes beyond what is available in collections that are currently dispersed over the world. Specific use cases were the Huygens ING project Migrant: Mobilities and Connection on Dutch-Australian Migration and theTulipana project of the Centre for Global Heritage and Development on Dutch-Brasilian migration. The main question of the workshop was how to develop standards and strategies for linking the diverse resources through digital methods, community governance and sustainable practices.

The key issues addressed during the workshop were:

- How can dispersed and heterogeneous data on migrants be linked to form a coherent resource? What can you contribute to it? What should the other participants contribute?
- How can such a resource be made sustainable? Who owns it or who should own it?
- How can the many privacy and ethical issues involved best be tackled?
- How to make a data cloud consisting of diverse resources accessible and query able?

The primary concrete result of the workshop will be a white paper on co-creation of cultural heritage and data linking of migrant heritage for which we will try to get UNESCO-status. However, the intangible outcomes of the workshop were at least as important: we experienced a shift from the 'individual paradigm' in humanities to the 'collaborative' paradigm. This was our common moment of enlightenment: all parties involved agreed that this would be an important way to bring together global migrant heritage and that it could serve as a model for scattered migrant data world-wide: as a source of identity and involvement for the migrant community and as a resource for cross-disciplinary research for academia. We already started this collaboration with two small cross-disciplinary grant proposals as unforeseen tangible outcomes (one for the creative industry (October 2016) and one to make the humanities infrastructure CLARIAH-Anansi privacy persistent (November 2016) in order to be able to make this a real Citizen Science project - in a sense a scientific breakthrough in itself.

For the format of the workshop we listened carefully to the advice of the experienced staff of the Lorentz Center. We skipped long plenary sessions and briefed the participants two weeks before the start of the workshop to be prepared to share their experiences and asked them to bring their own materials (powerpoints, prezis, actual heritage collections, databases, linked data solutions and other ways to make heritage materials accessible). Instead of papers we started each day with two or three 'dialogues': statements or position papers of 10 minutes, as a start of a plenary discussion, which was - most of the days - followed by discussion or hands on working in subgroups. Icebreaking and more general assignments were used to 'tease out' the different positions of the four groups mentioned above. To energize the group (and as a sign to 'report in' after assignments) we used a playlist with migrant songs from over the world, which worked pretty well. But most important: we created a Google Space for the participants. In this way, each participant was able to report about the interactions at the workshop (in general or on their own interactions with other participants) and put their notes on the Google Space. We still communicate on this platform on collaborative initiatives and use these notes by drafting and editing the white paper. Overall, the workshop and this format was highly appreciated by all the participants, as can be concluded from the report on Historici.nl by Hans Krabbendam

(https://www.historici.nl/spannend-niet-congres-brengt-nieuwe-samenwerking-tussen-erfgoedsector-academici-en-ict-ers-op-gang/)

We would like to thank the Lorentz-staff and especially Gerda Filippo for all the effort to make this inspiring workshop happen.

Marijke van Faassen (Den Haag, Netherlands)
Mara de Groot (Leiden, Netherlands)
Rik Hoekstra (Den Haag, Netherlands)

Analysis and Applications of Localized Structures in Nonlinear Media

29 August - 2 September @Oort

This workshop successfully brought together leading experts in the fields of nonlinear dynamics each with emphasis on different aspects of the study of localized structures in nonlinear systems. Its nature was truly interdisciplinary and encouraged exchange between a broad range of scientists ranging from pure analysis all the way to mathematical and experimental physics.

During the week a number of main themes of interest were identified to be

- freak/rogue waves and extreme phenomena,
- significance of time-dependent eigenvalues,
- evolution and bifurcation of patterns in different systems (snaking),
- derivation and justification of amplitude equations,
- stability of breather solutions in discrete and continuous systems.

The workshop opened with two overview talks by very well-known and experienced researchers in the field, who also set some of the major themes for the week and encouraged vivid participation. Three days had a designated theme (Applications, Discrete Systems, Continuous Systems), but contained a good mix of researchers with different specializations (dissipative, dispersive, quasilinear, etc. scenarios) and arriving from different disciplines (Mathematics, Physics, Engineering).

A number of groups emerged spontaneously, nucleating between the participants, focusing on a number of the above topics. In particular, the focus group on rogue waves examined techniques for computing such solutions localized in both space and time, and also explored avenues through which the stability of the patterns can be mathematically quantified.

Another focus group on discrete nonlinear wave/Schrödinger equations discussed the topic of discrete breathers and their connections to traveling waves on lattices, which can be thought of as discrete breathers modulo shifts. Analyzing the stability of these patterns and developing energy-based criteria for it formed the basis for a number of discussions on this theme. The iterations of numerous other researchers revolved around discrete systems of different types, from the classical FPU model and its asymptotic fate, to granular crystals and their dynamics, and from cellular automata models (emulating traveling waves) to dissipative nonlinear dynamical lattices, as well as disordered ones. These focus groups formed new and occasionally broad collaborative activities, which we expect to produce joint research publications between diverse sets of researchers.

Martina Chirilus-Bruckner (Leiden University)
Panayotis Kevrekidis (University of Massachusetts)
Vassilis Koukouloyannis (Aristotle University of Thessaloniki)

Emerging Institutions

Design or Evolution?

5 - 9 September 2016 @Oort

Institutional developments, i.e., creating rules that govern the society, are not as gradual and static as they used to be. In fact, environmental change and technological advancements call for rapid institutional development by policy makers along with an increasing role of the general public in changing existing institutions and creating new ones. The aim of this workshop was to bring experts from various disciplines together, in order to make a step forward in modelling and understanding institutional emergence by both design and evolution in today's rapidly evolving society. Our objectives were to:

- Reach a common language and understanding of what institutional emergence and evolution implies
- Become aware of the developments regarding institutional emergence, design and evolution in different disciplines
- Understand how the different perspectives and approaches can be bridged, complemented, and possibly integrated.

These objectives were all met during our one week Lorentz workshop. By using Ostrom's definition of institutions as a common ground, the researchers from a whole range of disciplines, from history to artificial intelligence, engaged in very lively discussions about what institutional design or evolution imply in their fields. Surprisingly, although several researchers used an organizational definition of institution in their research, they still managed to get on the same page and build on the discussions among the "institutions-as-rules" scholars.

From a historical point of view, researchers presented the state of art regarding institutional emergence and evolution. At the same time, experts from the field of economics explained how they design institutions. As such, by the end of the workshop, everyone became aware of the developments in other fields. This resulted in many research plans and research collaborations either bilaterally, or in groups. These connections were especially unique as scientists from very different fields were able to understand eachother, and discover how their agenda would complement each other.

As an example, one historian said that she would have never thought she would listen to the presentation of a computer scientists, understand so much and find this many common grounds. The same kind of observation was shared several times during the conference by different scientists. These commons grounds will hopefully be the seed to several short term and long-term scientific breakthroughs.

Organization

The general format of the workshop which was a combination of invited talks (max 2 per day) and group discussions, kept the level of motivation and engagement high throughout the week. However, the general observation was that the participants learnt more and were more enthusiastic about the talks. A shared online notepad[1] was used to write down notes during the talks, and was also used to further discussed unaddressed issues. Therefore, besides the general collective or group discussions, there was a very long and in-depth virtual discussion taking place even outside workshop hours. The

1 http://pad.eeni.tbm.tudelft.nl/p/EmergingInstitutionsWorkshop, username and password available upon request

shared notepad will be the source of a publication on the topic of this workshop. A final observation regarding the organization was that halfway through the week (i.e., Thursday) the participants were very tired, and were not able to focus as much as before. Having taken a flexible arrangements, the organizers decided to leave that afternoon open for participants. That boosted the energy for a very fruitful Friday. The last talk of the workshop was by a prominent economist, and all participants found it extremely inspiring.

In general, the group size which stayed around 35 (min 30, max 37) participants seemed to be the perfect size for a comprehensive and diverse group, yet small enough for a good level of engagement by all.

Giangiacomo Bravo (Växjö, Sweden)
Amineh Ghorbani (Delft, The Netherlands)
Tine de Moor (Utrecht, The Netherlands)
Jeremy Pitt (London, United Kingdom)

Extremes and Risks in Higher Dimensions

12 - 16 September 2016 @Oort

Extreme value theory (EVT) is the branch of probability dealing with the modeling and the study of extreme and rare events, i.e. events whose magnitude and occurrence over time is not usual, but rather seen as "extremely different from the average". The part of statistics dealing with the estimation of EVT models and their application to data is called extreme value statistics (EVS).

Over the years, EVT and EVS have become an exciting field of research, for the fascinating mathematical challenges they offer, but most of all thanks to the many important applications they have in many fields of hard and social sciences.

Within EVT and EVS, a rather recent field of research is the one related to multivariate extremes, or extremes in higher dimensions. When dealing with an earthquake, for example, we may not only be interested in the magnitude of the event, but also in its geographical extension, and the tsunami it may cause, when occurring close to the sea. Similar situations appear in hydrology, medicine or finance.
Our workshop has been devoted to the latest developments in the area of multivariate extremes. We were able to gather some of the leading scholars in the field, together with practitioners and many young researchers.

The scientific week has been characterized not only by the excellent invited talks, and the extremely good presentations given by the young researchers participating in our call for papers, but also, and we would say mainly, by the many interactions we have seen emerging, some of which leading to new collaborations. Every day, on average, at least 3 hours have been devoted to plenary discussions and brainstorming sessions, and we have appreciated the results. We have experienced a few "aha moments", in which scholars - theoretical and applied - and practitioners have shared challenging and compelling views. As expected, problems have been tackled from different perspectives, and it was great to see renowned scholars interact with new promising ones. New ideas have been discussed, old ones challenged, in a pleasant atmosphere. We surely expect new publications coming out from this exciting week, and we will surely notify Lorentz Center.

The help of all the staff at Lorentz Center, and in particular of Mr. Fritsen and Mrs. Jensenius, has allowed all the participants to only focus on the scientific part of the workshop, benefiting from the nice facilities and opportunities offered by the Center.

Many participants have described the workshop as one of the best ones attended lately. No need to say that even the social activities have been fundamental to offer such a pleasant week, and once again we thank the Center for the great organization.

Juan-Juan Cai (Delft, The Netherlands)
Pasquale Cirillo (Delft, The Netherlands)
Armelle Guillou (Strasbourg, France)

Galaxy Morphometrics

12 - 16 September 2016 @Snellius

Description and aims

The goal of this workshop was to bring as many as practical of the experts in galaxy morphometrics together to discuss both ways to convert the complex appearance of galaxies in astronomical imaging into a few simple numbers and how to interpret these. The aim was realized in that not just representatives from a single scheme to generate morphometrics were attending, but practically all. There were 22 participants and four walk-in attendees (for a day or so), which proved to be the right size for both lively discussions and a close atmosphere.

Format

The discussions started during the first talk by Chris Conselice (going overtime by 30min at least) which set the tone for the workshop. The participants started setting some of the questions we should think about:

- What do we define as a merger?
- Do we define a source and how? (+surface brightness dimming and color correction effects?)
- Mergers: what are the time-scales (for both pairs of galaxies and morphological features)?
- Clumpy galaxies; mergers vs star-formation?
- Do one component galaxies even exist?
- What do we call a bulge?

Subsequently, we loosely stuck to the program but did not enforce time limits since every scheduled talk sparked (welcome) discussion and thus ran typically over. The one exception was by Marc Huertas-Company who had to give his excellent talk on deep-learning techniques via remote/Skype call.

For the hack day a very large range of topics was suggested:

- What physics can we get from morphology?
- Creation of a unified code "WikiFit", inclusive and open source.
- Automatic detection of clumps & compare to visual classifications of clumps (and quality check for both).
- Can we identify the kinematically most "compact" feature?
- What features of usual classifications are of interest across redshifts (epochs)?
- Bulge/Disk fit code; a demonstration of "ProFit".
- How can we compare Sersic codes?
- Overview paper of Galaxy Morphometrics.
- Build your own zooniverse project in 1hr.
- Bar profile fitting into galfit.
- Test the number of arm predictions with GalaxyZoo2.
- GalaxyZoo for atomic hydrogen observations with radio astronomy.

On Wednesday afternoon we had the hack day. To decide which topic was the most interesting to work on, we used the wall in the coffee corner. The workshop split into three groups to tackle a) clump-finding, b) code standards/comparisons and c) combining morphometrics and kinematic information. The results from these hack sessions and the talks were discussed on our final session on Friday afternoon.

We had to make some accommodations and Jeyhan Karteltepe gave her keynote on Thursday. Brooke Simmons gave an un-scheduled, but excellent tutorial on how to start a Zooniverse citizen science project (something we did not get to on the hack day).

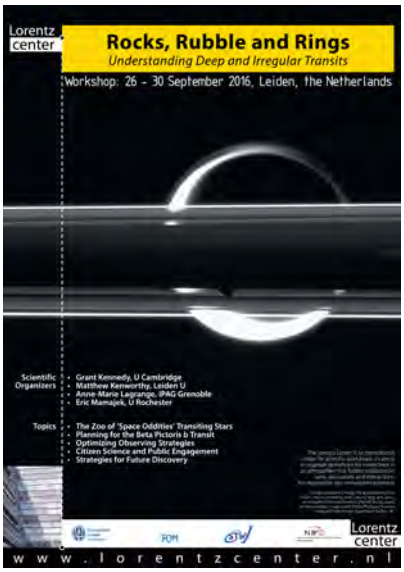
Scientific developments

The workshop was in our estimation an unqualified success and sparked several future projects and collaborations on publicly available (and publicly maintained community-effort) software packages. There was also discussion about a possible follow-up workshop or conference at another location to continue to tackle the galaxy morphometrics of all the coming future surveys (e.g. LSST, EUCLID & WFIRST).

Benne W. Holwerda (Leiden, the Netherlands)
Boris Häußler (University of Oxford)
Claudia Scarlata (University of Minnesota)

Rocks, Rubble and Rings

25 - 30 September 2016 @Oort



Science

We are at a very exciting point in understanding how planets and moons are formed around other stars. After twenty years of indirectly detecting planets by the physical effects they have on their parent stars, we are now discovering new phenomena caused by other material in these star systems. Material in the forms of rocks, rubble and rings around extrasolar planets can cast shadows across the universe that we can see here on Earth. The Workshop firstly brought researchers together who are discovering more and more of these light curves in data from cameras all over the world, and to prepare for an upcoming celestial event in 2017, where an exoplanet will move in front of its star, and we will be able to see if there are any rings surrounding this planet when the transit happens.

The first tangible outcome of the Workshop was a detailed plan of all the different science goals for the upcoming transit of the exoplanet Beta Pictoris b in front of its host star in 2017, and we had all the major partners present in the Lorentz Center talking and coordinating with each other, a significant milestone of preparation for the upcoming year.

Secondly, two separate groups who have extensive data archives, SuperWASP and KELT, discovered that they have an interesting light curve from a young star, and that during the Workshop they agreed to collaborate together and publish their data in a paper which is being written up now for publication, a significant result that will generate press when it is published.

Organization/Format

We started with a day of lectures, thinning out the lecture format through to the final day where we had the final presentations and the keynote speaker speaking in the late morning. This enabled people to stay for the friday morning but be able to travel back the friday afternoon. We found that the breakout sessions worked very well and that the balance was quite reasonable. Setting up a tag list of discussion points and having the breakout sessions worked well and engaged the participants.
We budgeted one half of an afternoon before the dinner for free time, but this was too short for excursions into the town. We should have given a whole free afternoon, but were able to fill the time with excellent discussion.
Printing out interesting light curves on long 3 meter rolls and hanging them along the corridor proved to be a very popular idea, provoking thoughtful discussion and liberal use of pens to decorate them with new hypotheses - we will definitely do that again in the future.

Grant Kennedy (Cambridge, United Kingdom)
Matthew Kenworthy (Leiden, The Netherlands)
Anne-Marie Lagrange (Grenoble, France)
Eric Mamajek (Rochester, NY, USA)

Women in Numbers Europe 2

26 - 30 September 2016 @Snellius

The Women in Numbers Europe 2 (WIN-E2) workshop brought together 40 established women researchers, young faculty, and advanced graduate students for research collaboration and mentorship. Unlike a typical mathematics conference, the main activity of the workshop was small-group research projects which have the potential to lead to ongoing collaboration between the participants. Each group had two leaders drawn from the participating senior mathematicians. Before participants arrived, they had been in contact with their group leaders, who suggested research projects and provided background reading and references. The goals of this workshop were: to highlight research activities of women in number theory, to increase the participation of women in research activities in number theory, to train young female researchers in number theory and related fields, and to build a research network of potential collaborators in number theory and related fields.

The WIN-E2 conference aimed to allow young women in number theory from more countries, and Turkey in particular, to benefit from the multiple advantages of this type of conference. There were 10 Turkish participants. The workshop had 6 groups, consisting of 2 co-leaders and 4-5 other participants. We took great care when forming the groups to take into account each person's background and preferred topics and also to ensure that each group had a variety of people at different career stages, ranging from PhD to professor. We also made sure that people got to work with women they had not worked with before and would not easily encounter otherwise, for example people from a different country or even continent! The variety of topics was sufficiently broad for each of the researchers, who came from all over Europe and Turkey and also from Brazil, Australia, Canada and the U.S., to find a group where they felt comfortable enough with the general background to address the topic.

The vast majority of the time at the workshop was spent working on the group projects but we also had five talks from young participants about their research. On the final day, we had a talk about a specific example of the impact of research done at WIN(E) conferences in the field of construction of CM curves. We also had short talks by the junior participants of all project groups describing the project they were working on, the progress they had made, and the future directions for their collaboration. Several groups had already produced some initial results after five days of intense group work! This demonstrates the time and care the group leaders had taken to design suitable projects, and also the very high standard of the participants. The project groups will continue their collaborations over email and Skype (or similar), with the aim of producing a joint research article in the 6-8-month period following the conference.

The joint research program is not the only advantage of the WIN(E) conferences; another non-negligible aspect is the stimulus they provide in the career of young women researchers. This stimulus takes a multitude of forms. First of all, many of the women attending the WIN-E2 conference were practically alone in their role as female researchers at their home universities, especially those from smaller departments or from colleges more oriented towards teaching. For these young women, it was inspiring to realize how many others like them are scattered around the world, and also to meet the more established researchers that could act as role models - professors with fully-edged, successful research careers - that many of the younger women had never encountered.

The social and working atmosphere of the conference were also very different from those that reign in mathematics conferences in general. Even when these are mixed, they are predominantly masculine; while this does not in itself represent any disadvantage for women, nevertheless the grouping of women sharing similar experiences at WIN-E2 made for a much more intimate atmosphere during

which all sorts of professional and personal problems could be raised and discussed together. Open discussions on the difficulties of women in mathematics research are generally confined to organized panels, whereas at WIN-E2 informal conversation helped many of the participants to express their difficulties and doubts and receive sympathy and advice on an individual basis. We also organized two panel discussions during one dinner and one coffee break - the first on the WIN(E) network and careers in mathematics in different countries in academia and industry, and the second specific to the job situation for women mathematicians in Turkey.

Irene Bouw (Ulm, Germany)
Rachel Newton (Reading, United Kingdom)
Ekin Özman (Istanbul, Turkey)

Tomography of the quark-gluon plasma with heavy quarks

10 - 14 October 2016 @Oort

This Lorentz workshop brought together the world leading experts from theory and experiment on open heavy-flavour, quarkonia and heavy-flavour physics from lattice Quantum Chromo-dynamics and provided a platform to discuss recent results from experiments and theoretical developments in the field of high-energy heavy-ion physics.

Usually, at major conferences and workshops in the field, a large amount of presentations is given in a row and not much time is available for the careful interpretation of the results. The advantage of this workshop was the focus on discussion of the recent measurements and theoretical findings to advance our understanding of the matter of the early universe.

38 male and 12 female persons from 12 countries all over the world participated. The program was setup in a way that we had 13.5 hours of plenary presentation to head up all participants on recent results and developments and 14.4 hours of discussions.

Three Discussion Groups, lead each by two conveners, allowed detailed debate among the experts on implications and open issues concerning the theoretical and experimental results centered around the following broader questions:

- A debate between lattice people and model builders about: Which of the proposed energy-loss mechanisms are compatible with the present lattice results?
- What are the next steps for the comparison of the different models for the heavy-quark energy loss in the QGP?
- What are the current crucial experimental issues and limitations? Can we identify key observables?

Leading scientists and graduate students (22% of the participants) from the Netherlands participated in this workshop and highly profited from the exchange with their international colleagues. Notably, this workshop contributed significantly to the selection of topics and experimental observables the Dutch research community will focus on.

This workshop was definitely a success since the envisaged goals were reached, namely

- the development of a common understanding and interpretation of the findings;
- an agreement among the participants was reached on the most important and urgent themes and questions (including the definition of further observables), which the field has to focus on in the upcoming five years;
- building up and strengthening the collaborations among the participants.

Most important, the planned document was drafted with main conclusions, perspectives and recommendations for the research community for the future (the paper draft is attached). Furthermore, an abstract was submitted to the most important conference in the field, the Quark Matter conference in 2017, to inform the community about the outcome of the workshop.

The organizers and all participants would like to thank the Lorentz Center for the generous financial and administrative support. Thank you.

Jörg Aichelin (Nantes, France)
Raphaël Granier de Cassagnac (Palaiseau, France)
Maria Paola Lombardo (Frascati, Italy)
André Mischke (Utrecht, The Netherlands)
Nu Xu (Berkeley, USA)

Physical Characteristics of Normal Galaxies at z>2

17 - 21 October 2016 @Oort

Our LC workshop (October 17-21) went well with a packed schedule of talks and discussion sessions. Contrary to many high-redshift workshops in the last few years, the focus was on what we can learn about the physical properties of normal star-forming galaxies in the early universe from the diverse multi-wavelength observations that are available -- where there are many opportunities for members of the community to learn from each other -- and not on similar analyses by many teams of the same observations with the Hubble and Spitzer Space Telescopes.

The workshop brought together communities studying high-redshift galaxies using optical and near-infrared telescopes with those studying galaxies at high redshift using sub-mm facilities such as ALMA, focusing more on the ISM and star-formation. A healthy sprinkling of theorists - working on both galaxy formation and high-mass stars - were invited to help place the various current observational results in an overall context of the current understanding of galaxy and stellar evolution.

Discussion was lively both during the Q&A sessions after the talks as well as the ~2 hours of scheduled discussion per day. A special ~2-hour long group activity was scheduled on the last two days mixing the scientists in attendance with colleagues of random expertise and institution. The goal for each group was to devise their own strategy to attack some of the observational/ theoretical unknowns which were the focus of the meeting, given a fixed allocations of telescope time on 5 facilities which were discussed during the program. Many participants reported that this activity was highly educational, and it encouraged participants to interact with others that they had not previously known and to learn about the capabilities of observational facilities of which they had little previous knowledge.

One pleasant surprise was how useful it was to include a discussion on high-mass stellar evolution in the program. While this topic could potentially have seemed uninteresting to the participants working with ALMA and obtaining spectra in the mm, it was realized during the discussion that it is also extremely relevant to these scientists.

The SOC received hugely positive feedback from participants after they returned to their home institutions regarding how much they enjoyed the workshop and the new energy/perspective they had for pursuing research:

> *"I'm not sure if it was the format of the meeting or the people you invited or the topics covered or both, but this was one of the most educational meetings I've been to in years. I left more energized about the stuff I'm working on, and have tons of new possible directions to go."*
>
> *"Thank you again, Rychard, for putting together this very interesting mix of people. It was great!"*
> *"I wanted to thank you so much for including me in this week's meeting! It was super-interesting and fun, and I had a really great time."*
>
> *"being a rude brit - i forgot to thank you before i left for an excellent conference. i thought it was interesting and fun - and the slightly chaotic organization just made it feel informal and relaxed - which i far prefer."*

The program definitely accomplished its goals in terms of a thorough and comprehensive exploration of each of the questions the meeting sought to address.

The female gender balance of the attendees (30%) was typical for smaller specialized astronomical meetings. With 46 out of 57 attendees as speakers or discussion session leaders, everyone's input got center stage (if only for a 5 minutes) with a good mix of senior and junior participants, local (NL) and international participants. The female gender balance of all the speakers reflected that of the attendees (36%) and the SOC (28%). Invited speaker female gender balance (20%) was typical for the field for a smaller meeting (22%[1]).

One couple brought their 18 month old daughter and while this worked out reasonably well, actual facilities (one of the offices has higher (standing) desks, some toys, a changing mat and a cot) could make this type of arrangement where both parents participate in a LC meeting a more common occurrence. Another suggestion could be a 'parental package' in addition to the normal LC workshop information with the locations of the nearest small child activities (playground, Naturalis etc). Childcare remains prohibitively expensive but with both parents present, they were able to manage, each attending half of the meeting.

Rychard Bouwens (Leiden, The Netherlands)
Romeel Dave (Bellville, South Africa)
Jacqueline Hodge (Leiden, The Netherlands)
Benne Holwerda (Leiden, The Netherlands)
Ivo Labbe (Leiden, The Netherlands)
Alexandra Pope (Amherst, MA, USA)
Paul van der Werf (Leiden, The Netherlands)

1 http://www.aas.org/cswa/percent.html

Serration Technology on Airfoil

Unsteady Aerodynamics and Aeroacoustics

17 - 21 October 2016 @Snellius

Description and aims

As wind turbine blades move through the air, they produce noise. To protect residents, maximum noise levels are set that may not be exceeded. To stay within the noise limit, wind turbines often need to operate at reduced speed, which makes wind energy effectively more expensive. Reduction of noise without reducing the rotor speed would therefore make wind energy cheaper and, hence, a more attractive alternative for fossil energy.

Wind turbine airfoil noise can be generated at the leading edges of the blades, through interaction with the atmospheric turbulence, or at the trailing edges, where turbulence in the boundary layer that develops on the blade surface scatters into sound. Interestingly, the same mechanisms are also responsible for a major source of noise in modern aircraft engines.
Airfoil noise can be reduced by serrating the edges like saw teeth, inducing destructive interference and loss of spanwise coherence. Other types of serrations, like brushes, pins, wavy or porous edges, are possible too. All these blade modifications are inspired by the wings of owls, who can fly without being heard. A vast amount of research on airfoil serrations, both theoretical and experimental, has been performed over the past 20 years, at universities and research establishments and by the industry. But still there is no complete understanding of the mechanisms.

The aim of this workshop was to bring together senior experts and a new generation of researchers from universities, research establishments, wind turbine and aircraft engine industry: aerodynamicists, acousticians, experimentalists, numerical experts and mathematicians. The idea was to assess the state-of-the-art of the prediction methods and the experimental capabilities, to identify challenges and to investigate possibilities for future co-operations.

The following challenges were identified:

- The aerodynamic performance must be maintained while reducing noise.
- Trailing edge serrations should be flexible, but what is the optimum stiffness?
- There is significant difference in experimental results from different facilities.
- Improvements of large-scale experimental facilities are necessary to account for the full range of relevant frequencies.

Format

In separate discussion groups the possibilities for joint future activities were discussed, for example measurements on a benchmark airfoil in several facilities. All participants were invited to join a COST action.

Scientific developments

Highlights of the workshop were the presentations about the rapid developments in "Particle Image Velocimetry" for unsteady flow measurements and "Lattice-Boltzmann" for CFD/CAA. Furthermore, a new serration type, a combination of saw tooth wedges and pins, showed to have high potential. The

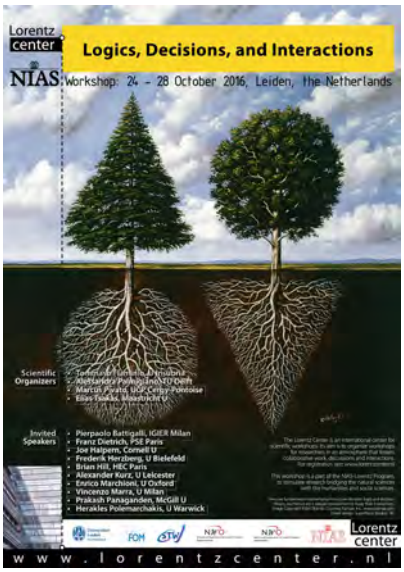
researchers were pleased to hear, from a wind turbine industry representative, that 1 dB noise reduction already leads to significant increase in wind energy production. In other words, this type of noise research is absolutely worthwhile.

The participants were all positively surprised by the venue and the workshop format.

Tze Pei Chong (Uxbridge, United Kingdom)
Daniele Ragni (Delft, Netherlands)
Pieter Sijtsma (Wezep, Netherlands)
Oksana Stalnov (Haifa, Israel)

Logic, Decision, and Interactions

24 - 28 October 2016 @Oort



The workshop "Logics, Decisions, and Interactions" has focused on the interaction and cross-fertilization between nonclassical logics, and decision theory, game theory and social choice. Decision theory, game theory and social choice is a research area interfacing economics, social sciences, philosophy and artificial intelligence. The workshop has aimed at bringing together the following communities:

a. logicians using nonclassical methods (including algebraic, topological, order-theoretic, proof-theoretic and category-theoretic methods);
b. researchers working in decision theory, game theory and social choice.

Researchers in group (a) can benefit from the challenges posed by the formalization of problems in the area of decision theory, game theory and social choice; researchers in group (b) have only been exposed to a fragment of the available logical formalisms and techniques, namely to those pertaining to classical (modal) logic and model theory, and have largely not been exposed to the tools and results of researchers in group (a).

In order to foster interaction between the various communities, the program consisted of nine keynote lectures (of one hour each) and nine discussion sessions (of one hour each), with the rest of the schedule given over to free-form discussion and work sessions. Each morning or afternoon consisted of one keynote and one discussion session, separated by a fifteen-minute coffee break, and then followed by a one-hour work session. This format worked extremely well, because it left a lot of time for informal discussion and interaction, and provided plenty of scheduling flexibility. Each of the formal presentations generated abundant discussion, which inevitably spilled over into the coffee break or work session which followed. Because of the very large amount of discussion, we often fell behind the formal schedule. But because the schedule was not too tightly packed with events, this did not create problems. All participants found these protracted discussions very interesting, stimulating, and informative, and appreciated the fact that there was enough time in the schedule for discussions to unfold in a relaxed fashion without hard time constraints.

The main goal of the workshop was to create a scientific platform and to define a common language that could be shared by all the communities involved so as to improve communication among participants and ground future interdisciplinary research. In addition to different conceptual frameworks and terminologies, participants in groups (a) and (b) have fundamentally different research paradigms: they have different ideas about what constitutes an interesting research question, and what constitutes a satisfactory answer to such a question. For example, participants in group (a) are often concerned about whether a certain mathematical result can be obtained in a *constructible* way (roughly speaking, this means it is something you could obtain through a computation) - a question which is largely absent from the research of group (b). On the other hand, participants from group (b) are often concerned about *incentive-compatibility* - something which is not an issue for group (a). Likewise, group (a) is often sensitive to certain criteria of "mathematical elegance" - for example, is a certain construction *functorial*? Does it have certain *universality properties*? In contrast, group (b) is concerned less with mathematical beauty and more with "economic significance". But one outcome of the workshop was to recognize that these two objectives are not as unrelated as they seem. For example, functoriality or universality are not just "aesthetic" criteria -they can sometimes be interpreted as the sort of "non-arbitrariness" or "invariance to model specification" which could be important to an economic theorist.

For group (a), a precise description of the *process* of formal reasoning is just as important as the outcome of that reasoning - for example, it is often the case that a mathematical statement which can be proved using formal system *X* cannot be proved (or perhaps, even *expressed*) using formal system *Y*, and for group (a) this is a significant observation. Oddly enough, although group (b) concerns itself almost entirely with the study of "reasoners" (i.e. rational agents), participants of group (b) have focussed very little attention on the technical details (and limitations) of formal reasoning itself. So it was valuable for group (b) to be exposed to the methodology of group (a) in this light. On the other hand, group (b) is sensitive to metatheoretical distinctions which are absent in group (a) - for example, the distinction between *normative* and *descriptive* investigations. Roughly speaking, a *normative* statement is a statement about how an ideal agent "should" behave in a certain situation - it is a description of ideal rational behaviour or ethical behaviour. In contrast, a *descriptive* statement is a statement about how actually-existing agents do behave in situations. The normative/descriptive divide arises because economics straddles the threshold between moral philosophy and social science. A common fallacy is to elide normative and descriptive questions, and practitioners of group (b) are (usually) careful to avoid this sort of mistake.

Another difference is in the representation of *knowledge* and *belief*. Participants from group (a) are mainly comfortable with representing knowledge and belief in terms of formal languages and the semantics of these languages. (A variety of semantic frameworks are available - e.g. algebraic, topological, and order-theoretic.) In contrast, participants from group (b) work mainly within a *Bayesian* paradigm, where "beliefs" are represented by probability distributions on a state space, and "knowledge" is represented via a Boolean algebra of subsets of that state space. These two paradigms are not entirely incompatible, but they are significantly different, with different strengths and weaknesses.

Because of these paradigmatic differences, there is much potential for miscommunication or miscoordination when advancing an interdisciplinary research project between these two communities. One of the chief benefits of this workshop is that it exposed both sides to the conceptual frameworks and research paradigms of the other side, thereby fostering increased interdisciplinary understanding which will be invaluable in future interactions between these two communities. The active, enthusiastic, and ongoing interaction among the participants testify that this goal has been largely achieved.

Alessandra Palmigiano (Delft, Netherlands)
Marcus Pivato (Ontario, Canada)
Tomasso Flaminio (Milan, Italy)
Elias Tsakas (Maastricht, Netherlands)

ICT with Industry 2016

7 - 11 November @Oort

Introduction

Since 2013, NWO and STW are collaborating with the research schools ASCI, IPA and SIKS in the organization of the ICT with Industry workshop. The main aim of the workshop is to stimulate contacts and future collaborations between researchers and professionals from industry and public organizations. At the 2016-edition the steering committee received overall very positive feedback from the participants. The most common remarks were, first of all, that the participants gained a broader view, and learned about new fields and the techniques that they use, which may possibly also be useful in their research work or within their organizations. Second, participants enjoyed meeting new people in a creative setting, yielding useful professional contacts for future collaborations. The workshop also allowed them to showcase their knowledge and skills, and thus gain more visibility. Third, participants appreciated gaining a better understanding of industry needs, and how their research may be useful for practical applications. The format of the workshop also gave people the opportunity to work on problems that they otherwise would not have had the time for. Finally, several participants appreciated the additional guidance from the steering committee in solving their specific cases.

Experience of the existing workshops, such as Physics with Industry, Life Sciences with Industry, Mathematics with Industry and the previous editions of ICT with Industry, was used as points of considerations for this edition. The Workshop ICT with Industry 2016 took place at the Lorentz Center in Leiden from 7 to 11 November 2016.

Problems & Outcome

The industrial partners presented their case study and objectives on the first day. Immediately afterwards, groups of participants began to brainstorm, to program and to look for possible solutions. Each team was guided by an academic team leader and the case owners. The case studies of 2016 were as follows:

1. **ING:** The IT world is in great flux, especially in the financial industry. Looking at the market expectations concerning continuous improvement and innovation, but keeping in mind that the financial industry is a multi-billion business with a huge legacy in the form of investment in its current IT infrastructure, it is necessary to rethink agility and extend it with the concept of sustainability. Sustainable Agility should help the industry to keep up to speed against acceptable costs. A key lesson is to master complexity. The prime method for doing so is to use abstraction to break the system down into substructures, and to very carefully define and maintain their interfaces. Failure to do so will inevitably result in an increasing resistance to change in your IT system, ending up in the chaos we are currently facing. The core challenge in this ICT with Industry project was to objectively quantify system complexity, making it possible to follow trends on how chaos develops in your system and to react timely and appropriately. Next to that, the ability to quantify complexity opens up the possibility to also express agility in a quantitative way.

2. **KLM & Thales:** Modern flexibilized zero-margin economy requires equally flexible collaborations between organizations providing services and/or products enabled by software. The appropriate concepts are called digital market places that impact the cross-organizational workflow systems and enterprise resource planning systems. As for the data exchange platform this means data

should be shared with many different partner organizations including governmental agencies, e.g. tax administration and customs, protecting access to all others. In order to respond to ad-hoc demands such collaboration networks should be able to quickly respond to their client's needs and be able to swiftly connect their business processes and supporting workflow systems. The aim of this ICT with Industry project was to create the basis for such digital market places and bringing together businesses and scientific disciplines including computer networks, business informatics, artificial intelligence and law, ontologies, systems architectures and ICT service design. An infrastructure for digital market places will be defined and trustworthiness will be safeguarded by agent-based monitoring and control agents that implement the rules.

3. **SNS Bank:** Code coverage improvement of database-centric applications. When developing software, two aspects are of great importance: time-to-market and quality. Time-to-market influences the success of new features and allows for quick feedback (data) which in turn can be used for continuous improvement. The quality of the software itself is key for high availability as well as ensuring a good user experience. To allow for these aspects to be guaranteed, SNS Bank N.V. focusses on continuous integration/delivery including automating test-cases, as well as automating software quality assessment. Within this process there were two challenges. Firstly, the available instruments used to assess quality are often not accurate enough. Secondly, automation mainly focuses on the execution and re-execution of test-cases. Their construction is a manual process, which is costly. The goal of this project is twofold: (1) we want to define metrics for code coverage quality assessment for database-centric applications (having complex logic in the embedded queries), and (2) we want to automate the construction of code coverage tests.

4. **VLPB:** Currently, data is generated for thousands of accessions with each containing tens of millions of markers. Having many (e.g. over 1000) high density genotyped individuals available for per species will become reality for breeding companies within the coming years. The de facto standard for storing variants is in specialized compressed binary files (BCF/VCF), which are indexed to allow for random access to specific genomic positions. Although these positional queries are very fast, they do not allow for flexible and fast interrogation of the data on other features than position. The solutions space is large. A plethora of infrastructure and analytics solutions is available for generic applications in Big Data. It is not obvious which solutions are most suitable for genomics applications and form robust solutions for breeding companies towards the future. The objective of this project was to investigate possible Big Data solutions for high performance and flexible querying, computation and analysis on billions of genotype scores. For applications of genomics big data in breeding companies can we simply pick an existing solution and implement it? Do we need to pick several components from the large number of existing solutions and combine these in a way that suits our needs? Or do we have such specific and distinct requirements that we need custom built solutions?

In short, the workshop resulted in new collaborations and research ideas, which all have the potential to be further developed into research proposals. Funding possibilities were offered by NWO and STW.

Governance

The steering committee consisted of:

Claudia Hauff (Delft, The Netherlands)
Alexandru Iosup (Delft, The Netherlands)
Ana-Maria Oprescu (Amsterdam, The Netherlands)
Arend Rensink (Enschede, The Netherlands)
Joaquin Vanschoren (Eindhoven, The Netherlands)
Remco Veltkamp (Utrecht, The Netherlands)

Theoretical Foundations for Learning from Easy Data

7 - 11 November 2016 @Snellius

Description and aims

Under a wide range of conditions learning becomes easier than in the worst-case, either computationally, or information-theoretically. Examples of such conditions include margin conditions in classification, exp-concavity of the losses in sequence prediction and perturbation robustness for clustering. Recent years have seen a dramatic development of ideas related to exploiting "easy data" (which is the data that would arise under such conditions).

The main goal of the workshop was to get an overview of these developments across various subfields of machine learning, ranging from supervised, through reinforcement to unsupervised learning so as to deepen our understanding of these conditions, with the ultimate aim of furthering the development of algorithms that simultaneously exploit easy situations while still being close to worst-case optimal.

Format

To achieve this goal, we had several tutorial talks by world-class experts in the relevant subfields. These speakers - who were chosen because of their reputation as excellent communicators - consistently did an outstanding job in providing overviews of the key results and techniques in their respective fields, as well as in pointing out key similarities and differences between the various subproblems. We felt that all participants learned a lot.
Apart from the tutorials, we had several short-contributed talks about cutting-edge research, both by some of the most senior people in both fields and by some 'up-and-coming', highly promising junior researchers. We should also note that almost all invitees accepted our invitation, resulting in stimulating discussions during and after the presentations, and allowing participants to get a good overview of the subject matter. We feel that all participants have a much better overview of 'easy data' conditions and how they relate in superficially unrelated applications such as clustering, supervised learning etc.

Scientific developments

Several participants told us afterwards that they really enjoyed both the workshop contents and its organization. Given all this, we consider the workshop a major success - where we emphasize that the main underlying reason for the success is the Lorentz Center concept itself with its excellent facilities and extremely friendly and capable staff, which allowed not only the participants but also the organizers to focus on science with no distractions. A second reason seems to have been the composition of the group - the right mix of junior and senior researchers. Whereas we initially had plans to create working groups etc., it turned out to be unnecessary and we decided not to: right after the first few talks people started working together in small groups, in some cases until late at night.

We would like to acknowledge the support we received via the European Research Council under ERC Grant Agreement 320637 (advanced ERC Grant Prof. Dr. A. van der Vaart).

Maria-Florina Balcan (Pittsburgh, USA)
Shai Ben-David (Waterloo, Canada)
Peter Grünwald (Amsterdam, the Netherlands)
Gábor Lugosi (Barcelona, Spain)
Csaba Szepesvári (Edmonton, Canada)

Value Sensitive Design

Charting the Next Decade

14 - 18 November 2016 @Oort

Description and aims

Value sensitive design (VSD), under development for almost two decades, offers a theoretical and methodological framework to account for values in design. Some of the current challenges to VSD are to account for the increased embeddedness of computing and information systems in society, and to consider interaction with technology over time and context. The workshop had three primary goals: (1) to identify a set of grand challenges to shape the next 5-10 years of work in value sensitive design; (2) to identify community resources that could be built to help the value sensitive design research community to flourish over the next decade; and (3) to build a value sensitive design research community comprised of young and senior scholars.

Tangible outcome

Before, during and after the workshop, participants jointly worked on writing 'VSD nuggets' and 'grand challenges'. A VSD nugget is a 3-5 page piece of writing on a new idea, method, challenge, application or other concept related to VSD. A grand challenge is a research challenge that requires work of multiple researchers over a longer period of time. We collected about 25 VSD nuggets (written individually), and 14 grand challenges (written in groups). We will publish these, together with a summary of the workshop in the *Journal of Ethics and Information Technology*. Publication is anticipated for late spring 2017. Participants also sketched a plan for future workshops/conferences, including applying for a Dagsthul Seminar (Germany, 2017), a Whiteley Center Meeting (United States, 2018), and a larger conference at TU Delft (The Netherlands, 2018 or 2019).

Scientific breakthrough

Identified these grand challenges: Frameworks for eliciting, defining and prioritizing values; Framing and addressing value tensions; Stakeholders; Value sensitive design and practice; Value sensitive design pedagogy; Evaluation and critique; Value sensitive design and tech policy; Application areas; Accounting for power; Cultural sensitivity; Value sensitive design and intelligent algorithms; and Values and emotions.

"Aha" moments

- Hands-on experiences and demonstrations were wildly appreciated by participants;
- Broad interest in bringing VSD to new application and research contexts;
- Facilitated a good number of new introductions among researchers, both junior and senior.

Workshop format

The workshop program contained a mix of the following formats:

- 1 minute introductory presentations (all participants had submitted 1 slide)
- Working groups (working on grand challenges)
- Presentations (to set the stage and to report back from working group)
- Distinguished conversations (interviews and group discussions with keynote speakers)
- Workshopping papers (short presentations of ongoing work with discussant)
- Hands-on experience sessions (demonstrations of VSD research and teaching/training methods)
- Writing nugget peer review
- Unconference sessions (open slots for discussion groups on topics proposed by participants)

Some of the Highlights were: the 1-minute introductory presentation (to get to know each other), Hands-on experience sessions (we organized an extra session because participants asked for it), and the Distinguished conversations (more interactive than a keynote talk).

Other comments

The feedback provided by the Lorentz Center was very useful, both on proposal before submitting (which helped us formulate clearer desired outcomes), and on the workshop program at the intake (e.g. sufficient breaks, allow for flexibility in the program, Thursday is often the most productive day).

Batya Friedman (Seattle, USA)
Maaike Harbers (Delft, The Netherlands)
David Hendry (Seattle, USA)
Jeroen van den Hoven (Delft, The Netherlands)
Catholijn Jonker (Delft, The Netherlands)

Physics with Industry 2016

21 - 25 November 2016 @Oort

Description and aims

In this year's edition of the Physics with Industry workshop, 35 researchers worked on five real-world industrial problems during five consecutive days. Dunea, Lievers Holland, Philips, SensorTags Solutions and Shell participated with an industrial case. The industrial cases were selected by a scientific committee after an open call during which companies could submit a case. All of the industrial case owners declared that the proposed solution of the workshop week really helped them to develop their case further. The submitted cases ranged from testing theoretical or hypothetical opportunities to improving existing technologies. Surprisingly, the most practical case, dealing with the compacting of concrete, showed the most out-of-the-box solution, but some real experiments had to be done to get there. In another case, where the issues in the generation of ultrapure water droplets using a mesh nebuliser were investigated, the solution emerged from theoretical analysis. A third case used modelling as a tool to obtain a solution.

Format

All of the cases were coached by an academic and an industrial supervisor. This guaranteed the scientific quality and the applicability of the solution. The participants enjoyed the workshop due to the scientific challenge but also through experiencing how industrial problems are solved and how companies work. A few comments from the participants:

> *'I had the opportunity to experience for a week what it feels like to work for a company. It made me realise that my knowledge can actually be applied to real problems, which is very reassuring.'*

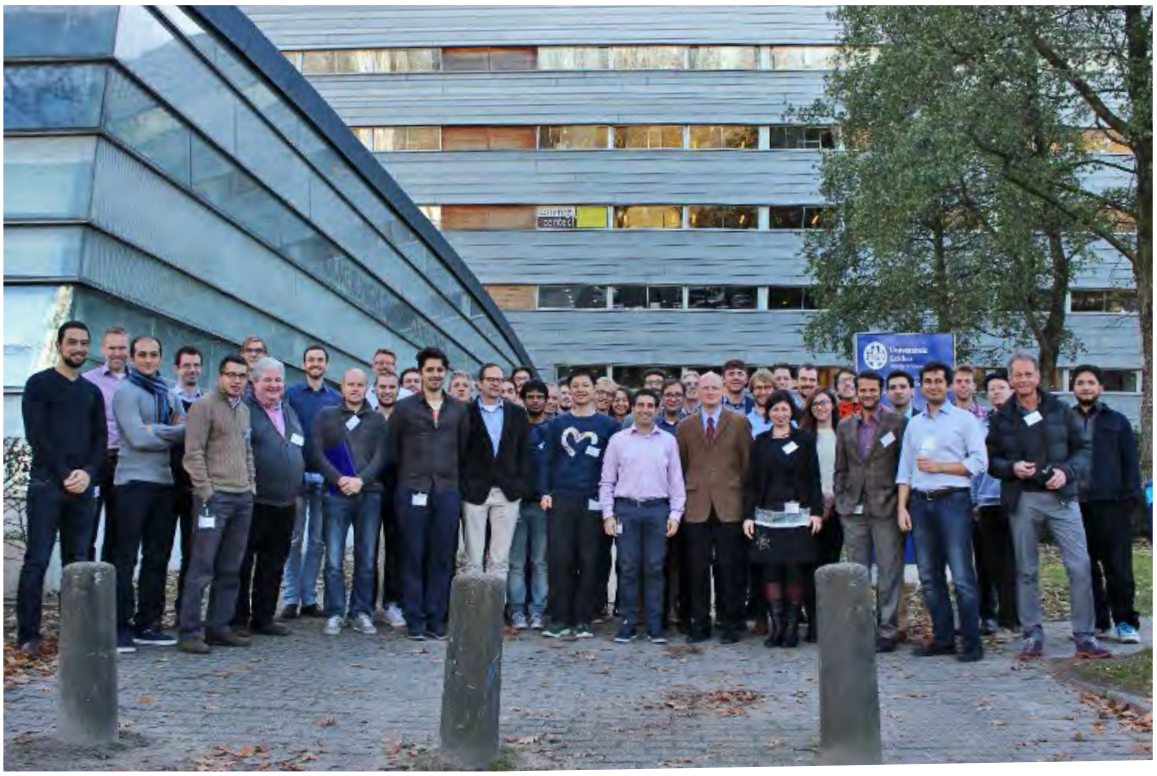
> *'I have seen what the benefits and dynamics of teamwork are and I learned a lot about practical/ industrial problems.'*

> *'I learned a lot about industry life. As a PhD student you are used to academic life and industry can be scary. But this workshop and our case showed that industry can go hand in hand with science.'*

The workshop was held from 21 to 25 November 2016 at the Lorentz Center in Leiden. The project is a joint collaboration between FOM, Technology Foundation STW and the Lorentz Center. The findings and suggested solutions will be published online by the end of January 2017.

Michiel van den Hout (Utrecht, the Netherlands)
Jeroen van Houwelingen (Utrecht, the Netherlands)
Melvin Kasanrokijat (Utrecht, the Netherlands)
Maria Sovago (Utrecht, the Netherlands)
Xavier Weenink (Utrecht, the Netherlands)

Presentation and award ceremony on Friday



Participants Physics with Industry 2017

Nanowire superconducting single photon detectors

28 November - 2 December 2016 @Oort

The goal of this workshop was to bring together theorists and experimentalists studying the detection mechanism in nanowire superconducting single photon detectors, a type of photodetector which is particularly promising for the near infrared, in applications where high efficiency and high speed are paramount. There has been strong technological and theoretical progress in this field recently, however there are still open questions regarding the working mechanism of these devices.

To achieve our goal, we have brought together not only theorists and experimentalists in the SSPD field, but also condensed matter physicists studying thin-film superconductivity, to make a synthesis of the available evidence and to learn from the progress made In the other connected fields. In total, 55 persons participated in the workshop, of which about 10% did not have a strong connection to the SSPD field. All worldwide groups working on SSPD physics were represented and presented their results.

We have chosen to have the scientific talks given preferably by the junior researchers in the field, whereas the eminences grises of the field were asked to moderate the sessions. This approach had two major advantages: first, it gave junior scientists the opportunity to present themselves, but more importantly, it gave leeway to more profound discussion about the experimental data, since the junior scientists were less prone to present a totally discussion-free talk. All 4 workshop days were ended with a general discussion session, where the presented data of that day was discussed, and put into perspective.

The discussion sessions were actually particularly useful in advancing the field. It helped to have prolonged discussion between theorists and experimentalists to understand details about theory and experiment, that could be essential for answering the open questions. In hindsight, we would have perhaps added even more discussion sessions, as the fact that we had only a discussion at the end of the day meant that we had about five-seven talks to discuss in a one-hour session.

As an example of the increased understanding of the field, all experts on the polarization response of SSPD devices were present at this workshop. Prior to this meeting, there were two proposed effects to explain this polarization response. At the workshop, we were able to collate the evidence and conclude that both effects must play a role.

The discussion sessions also led to ideas for new experiments. From the talks of the condensed matter community, it became clear that we have insufficient knowledge of the material properties of the system, in particular the role which disorder plays in weakening superconductivity. This led to a plan from NIST - one of the major groups in this field - to perform a series of experiments there to investigate this effect.

Also for the "visiting scientists" from the condensed-matter community, new possible experiments were extensively discussed. For instance, it was proposed that the absorption of a single photon could be mimicked in an STM experiment where a single electron with a comparable energy as the observable photons can be injected in a superconducting nanowire.

In short, the workshop was a great success. This is even more reflected by the fact that already halfway through the workshop, an initiative was undertaken to organize a similar workshop in two years' time. The support of the Lorentz Center, as well as the financial support of the H2020 COST Action, were essential to the success of the workshop.

Eduard Driessen (Saint-Martin D'heres, France)
Francesco Marsili (Pasadena, United States)
Alexander Korneev (Moscow, Russia)
Jelmer Renema (Oxford, United Kingdom)

WoW: the Week of WEAVE

28 November - 2 December @Snellius

The Week of Weave took place November 28 through December 2nd 2016 and thanks to the support of the Lorentz Center @Snellius. The week was divided into a first phase gathering the Galactic Archaeology team responsible for the WEAVE survey of our Galaxy as a complement to Gaia (WEAVE-GA), followed by a 1-day meeting of the WEAVE Survey Working Group.

A. WEAVE Galactic Archaeology Surveys: (November 28 through December 1st).

Around 25 people were present throughout the meeting, gathering core WEAVE-GA team members, as well as different actors of the project (WEAVE Principal Investigator, Project Scientist, and leads of work-packages with direct impact on the WEAVE-GA survey planning such as data reduction systems, archiving, etc.). The meeting started with a full day in plenary session, with presentations of the different sub-surveys, science cases, and systems, while the three following days had a mixture of shorter plenary sessions or discussions, and ample time for discussions and hands-on work in smaller subgroups (making extensive use of the different Snellius working areas). At the end of each day we had a short summary of these splinter sessions as a plenary group.

As a result, we have made significant progress towards the expected goals of the meeting, that we outline below:

i. To complete the design and target selection of the WEAVE-GA survey in the light of Gaia DR1

The WEAVE surveys rely on the delicate task of designing and implementing a target selection as simple as possible (i.e. that can be reproduced easily and reliably in models) while aiming at efficiency (maximizing the number of targets of interest). This is mandatory to ensure that the obtained WEAVE-GA spectroscopic samples lead to sound interpretations when compared to models. This delicate task for GA relies on using various ancillary data for target selection: multi-colour photometric surveys (e.g. SDSS, Pan-STARRS, VPHAS, IPHAS) and for the first time in planning a spectroscopic survey, Gaia itself (photometric and astrometric Gaia measurements). The first Gaia data were released September 14th 2016, offering: i) stellar positions (α, δ) and G magnitudes for all stars with acceptable formal standard errors on positions; ii) the five-parameter astrometric solution - positions, parallaxes, and proper motions - for stars in common between the Tycho-2 Catalogue and Gaia. Although the WEAVE-GA surveys will need Gaia DR2 (five-parameter astrometric solutions for all stars in the Gaia limiting magnitude range), DR1 has allowed us to build up a much better understanding of what can be expected for DR2.

The meeting has allowed the various WEAVE-GA sub-surveys to be brought to a homogeneous level of readiness; the surveys definition were solidified to a much higher level of readiness (i.e. target selection functions solidified including the Gaia data). This would not have been achieved without the extensive discussions within and across the various sub-teams allowed by the format and length of the meeting@ Snellius.

ii. To ensure the proper degree of communication and discussions within the WEAVE-GA science team

Beyond the target selection milestone outlined above, for good progress, regular face-to-face meetings of the WEAVE-GA steering group are mandatory in addition to the telecons held by the group every two weeks. The other on-going issues that will be discussed at the meeting within the group include:

- Discussions/actions of sub-surveys interfaces and communalities
- Discussions/actions of the WEAVE-GA team with the WEAVE Core Processing System (CPS, data reduction) and Advanced Processing System (APS, classification and analysis) and the archive team (WAS).

The meeting has reached completely both these goals. With the second goal, we even went further than what we had set out to achieve, leading to a much tighter relation of the WEAVE-GA science team with the more project-driven activities of CPS/APS/WAS. On this chapter, one can note in particular: a change in the chart and responsibilities within the project to charge the science teams with a new role in quality assessment of the surveys and data; the goals of the next Operational Rehearsal planned within the project were also enlarged to best fulfil also the needs of the science teams in terms of simulated performances. Both these significant changes (improvements) in the interactions between science teams and the technical side of the project would not have been possible without the meeting @Snellius, and will benefit the project far beyond the Galactic Archaeology part of the science team.

B. Survey Working Group Day (December 2nd)

The SWG day saw around 30 participants, with a handful of people also connected via Google Hangouts engaging in the first face-to-face meeting of the WEAVE SWG (Survey Working Group). The group, comprised of representatives from each of the seven Science Teams of the WEAVE survey and select members from the Project, will have a variety of responsibilities for the whole WEAVE survey. After an initial round-the-table introduction, the day began in earnest with a review of the responsibilities of the SWG, both in the short and long term. Discussion topics ranged from the best way to enable smooth communication within the group in the lead-up to the 5-year survey beginning in 2018 as well as during the survey proper, to details of interfaces that the SWG will have with various nodes of the WEAVE Project and Consortium. We ended the intense and productive day with a round-the-table session of questions, which allowed clarification of issues that had not been touched upon during the day, as well as highlighting topics for further discussion.

The scheduling of this one-day meeting as the final day of the Week of WEAVE meeting @Snellius was ideal, as discussions that had already occurred during the rest of the week helped consolidate real-time developments of some details of the running of the WEAVE survey, and already having familiarity of the facility enabled us to run the programme for the single day very efficiently.

Vanessa Hill (Nice, France)
Shoko Jin (Groningen, The Netherlands)
Teresa Antoja (Noordwijk, The Netherlands)
Giuseppina Battaglia (Santa Cruz de Tenerife, Spain)
Nicholas Walton (Cambridge, United Kingdom)

The Universal Problem of the Non-Universal IMF

5 - 9 December 2016 @Oort

The stellar initial mass function (IMF) is a fundamental concept for understanding the light we receive from galaxies and star clusters, and lies at the heart of the star formation process itself. Studies of resolved stellar populations in our own galaxy and its close neighbours indicate that the form of the IMF does not vary, suggesting that it is a universal feature of star formation. Recent detailed studies of massive elliptical galaxies, however, indicate that in the central regions of these objects, the IMF may take a different form at the low stellar mass end.

Star-forming galaxies also suggest variations from the standard IMF at the high mass end. Studies using alternative techniques support some aspects of these findings, but detailed agreement between methods is still lacking. Moreover, how these variations can be understood from an ab initio theory of star formation is as yet unclear.

This workshop brought together 50 international researchers from across a range of astronomy disciplines each impacted by a non-universal IMF, with the following aims:

- Disseminate knowledge between participants about the key systematic uncertainties associated with the various approaches to IMF determination;
- Generate a set of agreed tests of IMF determinations from independent techniques, and form new collaborations to carry out these tests;
- Discuss specific implications of a non-universal IMF to galaxy formation and evolution studies in general;
- Discuss ways to summarize the range of views on the IMF expressed within the workshop, and communicate these to the broader astronomical community.

The format of the workshop put strong emphasis on group discussion, structured around seven topical sessions, each given half a day. Every session had two keynote speakers to review the topic, and a chair to facilitate discussion. There was no fixed schedule of talks, though all participants were requested to contribute up to 4 slides to trigger discussion, and could contribute to multiple sessions. One afternoon was dedicated to a plenary group discussion, encouraging work in groups on specific issues. Groups reported back on their findings to the full group.

The workshop was very successful in meeting its goals, particularly in bringing together experts who tackle the IMF from different stand-points, and taking steps to standardise how we present and talk about the IMF in general. A good number of graduate students attended the workshop, and were encouraged to contribute. From the group-work sessions, a number of key observational tests were constructed, and several initiatives were taken to share observational data on a few key test cases to resolve discrepancies. An important discovery was made during the meeting related to apparently discrepant results, which could be explained by subtle differences in the assumptions made in the analysis. Some of these outcomes will result in publications presenting cross-comparisons and resolutions to discrepant findings.

The Lorentz Center was the perfect venue for this workshop, and the support team was crucial to our success. In particular, we valued the feedback on maintaining gender balance in our workshop program, and in guiding us to make full use of the workshop nature of the event, as distinct from a standard conference. This greatly increased the enjoyment and relevance for participants, and the overall quality of outcomes. The Lorentz Center continues to be a uniquely valuable facility for bringing researchers

together to make progress on timely issues, diffusing knowledge, and training the next generation of researchers on how to collaborate and interact productively with their colleagues.

Daniela Calzetti (Amherst, MA, USA)
Ignacio Ferreras (London, United Kingdom)
Richard McDermid (Sydney, Australia)
Russell Smith (Durham, United Kingdom)

Analysing Science Teachers' Pedagogical Content Knowledge

Digging into the data

5 - 9 December 2016 @Snellius

Effective science teachers possess specialized knowledge about their subject matter and how to teach it in order to support student understanding. This form of teacher knowledge, referred to as *Pedagogical Content Knowledge* (PCK), is built up over time, through experiences of teaching specific content topics, using particular teaching approaches, to particular learners and in particular contexts. Understanding how such knowledge develops and how its development might be successfully supported has been an important focus of science education research internationally over the past 25 years. However, researchers use rather different conceptualizations of PCK and research methods and instruments to study PCK and its development; therefore, the workshop aimed to:

- develop a shared language to describe the nature of PCK, and criteria to identify PCK with different instruments;
- reach consensus on a model of PCK that is strongly connected with empirical data of varying nature and can be used as a framework for the design of future PCK studies.

To meet the abovementioned aims, a book will be produced that includes a) a model of PCK, which is based on a preliminary consensus model, available at the start of the workshop, and updated through the discussions during the workshop, and b) concrete examples of different studies that use this model as a framework to characterize or identify PCK from empirical data.

Given the design of the workshop (see below), there were many smaller 'aha' moments for individual participants, in particular, during small group discussions in which the work of participants was discussed in-depth, using research instruments and empirical data as input. Recognition of similarities with their own work were frequently reported by participants. The whole group sessions helped participants to discuss and understand issues of common interest. During the last session, the whole group actively contributed to the construction of a revised version of a PCK consensus model.

The workshop format alternated whole group with small group sessions. In addition to the 24 participants, two facilitators were asked to join the workshop for the whole week. These facilitators were science education researchers who were well-known among participants as knowledgeable about PCK research. Whole group sessions consisted of presentations by some of the participants, and discussions led by the facilitators. Each participant led a small group session, based on materials that each had submitted prior to the workshop, which had been studied by the other members of the respective small group.

The first 2,5 days of the workshop followed the planned program rather strictly, however, the last two days had a more open structure. Led by facilitators and organizers, the whole group discussed and agreed about the program of these two days, aimed at maximizing the outcomes of the workshop for all participants. This way of working turned out to be very successful. There was a high sense of engagement, which was apparent from the active contribution of all participants to all sessions.

Working with facilitators contributed importantly to the flow and the outcomes of the workshop. An excursion on Wednesday afternoon, i.e., to Amsterdam, helped to relax the participants after working intensively for 2,5 days, and probably refresh them for the second half of the workshop. We concluded

the workshop with a seminar to which 22 researchers (mostly junior, from The Netherlands, Belgium and Germany) in the field of PCK were invited. These researchers presented their current work, using posters and discussed this with workshop participants, thus receiving feedback from world-renowned scholars on their studies. This session was highly appreciated by the invitees.

Finally, the support of the professional staff and the wonderful facilities of the Lorentz Center helped a lot to create an engaging atmosphere!

Amanda Berry (Melbourne, Australia)
Andreas Borowski (Potsdam, Germany)
Janet Carlson (Stanford, USA)
Jan van Driel (Melbourne, Australia)
Sophie Kirschner (Giessen, Germany)

Egypt Incorporated

Economic, Political and Cultural Developments from Late Antiquity to Islam

12 - 16 December 2016 @Oort

From 12-16 December 2016 we organized a workshop 'Egypt Incorporated: Economic, Political and Cultural Developments from Late Antiquity to Islam', which was facilitated by the Lorentz Center.

The workshop had three main aims:

- to advance methodological insights in the relevant fields,
- to further scientific insights on the thematic of the workshop leading to an integrated publication,
- to build on existing and form new academic networks through planned cooperative programmes.

The workshop addressed two main questions:

- what kind of interaction across the Mediterranean existed in the Late Antique and early Islamic period?
- what was Egypt's role therein?
- how did Egypt function in the Roman and Islamic Empires it belonged to?

These questions were examined through three themes:

- 'Networks and Connected History';
- 'Transregional Communities';
- 'The Impact of the Muslim Conquests'.

Participants of different linguistic and disciplinary backgrounds working on different periods and areas discussed common topics together on the basis of pre-circulated papers. We invited specialists with different linguistic and disciplinary backgrounds who were in different stages of their careers. In doing so, we brought together expertise in various periods and areas.

We experienced the workshop's format as very refreshing: rather than following a conventional format (papers followed by discussion), we organized various types of sessions in which thematic discussions in subgroups were alternated with discussions on papers that were pre-circulated by the participants and a three key lectures. This informal and low-key structure invited a lively interaction between the participants. In the plenary sessions the results of the subgroups' discussions were brought together and put on the wall, so that these results remained visible during the workshop. The discussion of individual paper profited from this approach as it invited all to think about the relation of her/his individual study to the 'bigger picture'. One example is the connection made in one of the plenary discussion sessions between two papers widely diverging in topic and scope (one discussing central authority, the other one local scribal practices), which was identified as illustrative for establishing how top-level policy has impact on even the lowest level.

In the final session, all participants brainstormed about the framework of a volume, which will be the tangible product of the workshop. Its envisaged title is: Incorporating Egypt from Constantinople to Baghdad. We have formulated two main questions to which we request each contributor to relate to:

- How was Egypt drawn into larger (political, economic, cultural) structures and developments?
- How did Egypt operate within these larger structures?

We think that the title of the volume covers these two questions (question one = Egypt becoming incorporated in historical contexts; question 2 = functioning of Egypt while being incorporated) and that it, moreover, refers to our agency as giving a prominent place to Egypt in historical research. Moreover, with these questions as point of reference, the contributions will form a truly integrated academic account that is much more than a series of edited volumes, but rather offers a multispectral examination of the proposed thematic. Most participants have confirmed to contribute to the proposed volume.

As the organizing committee, we look back on a very successful and inspiring workshop. That the participants shared our experience was confirmed by the enthusiastic reactions we received afterwards. We warmly thank the Lorentz Center for hosting and facilitating our workshop and for the logistical support. We would certainly recommend other scholars to organize a workshop at the Lorentz Center.

Roger Bagnall (New York, NY, USA)
Jelle Bruning (Leiden, The Netherlands)
Sylvie Denoix (Paris, France)
Janneke de Jong (Nijmegen, The Netherlands)
Petra Sijpesteijn (Leiden, The Netherlands)

The Invention of Lying

Language, Logic & Cognition

9 - 13 January 2017 @Oort

Description and aim

Lying is an everyday phenomenon that is central to social inter-action. The aim of this workshop was to bring together researchers from the humanities, social sciences and exact sciences to explore the possibilities of connecting the various strands of research on lying and verbal deception. The goal was to contribute to a comprehensive account of these phenomena from the perspectives of linguistics, logic, psychology, computer science, artificial intelligence, cognitive science and biology. The five themes of the workshop were (i) the production of lies, (ii) the detection of lies, (iii) costs and benefits of lying, (iv) individual and cultural differences in deception, and (v) the future of lying.

Outcome

A tangible outcome of the workshop is a special issue proposal to the journal Topics in Cognitive Science on lying and deception. The contributions to this special issue will be partially based on presentations given during the workshop, but other contributions, resulting from interaction of different communities during the workshop, will also be made. There are 14 expressions of interest for submission. The special issue trajectory is likely to take more than a year before completion.

Aha moments

A strong aspect of the workshop was the interaction of rather different communities. Both keynote talks, shorter talks, and a rump session of ash talks were given at the workshop. To mention some `outlier' subjects: Giorgio Ganis (Plymouth Uni), active in cognitive neuroscience, gave a splendid presentation on different brain areas activated when subjects tell the truth or tell lies; Marija Slavkovik (Bergen Uni), gave a survey of lying in judgement aggregation and voting - strategic voting is a form of lying. Various participants observed openly that they had never guessed that lying was so actively and widely pursued in communities very different from their own.

Organization/Format

The workshop started each day at 10:00 in the morning. This format seemed to work well. For each of the five topics mentioned above, three to five discussion groups were formed every day, wherein subthemes of those topics were discussed in depth. For example, for 'Production of lies', a subtheme was 'Can lies be categorized in terms of complexity?' and for 'Detection of lies', a subtheme was 'Can one distinguish lies from mistakes?'. Attendance of groups was open to change. People shifted widely between different discussion groups, as was our intention. A Boerhaave Lecture on Tuesday evening was part of the workshop. This asked for some improvisation, as the originally proposed speaker unfortunately had to cancel a few days before the start of the workshop. We are indebted to Jan Henk

van der Velden, who talked on lying from the perspective of active law practice, to stand in at the last minute. Various participants to the lying workshop were actively involved with Lorentz staff on future workshop proposals, encouraged by our workshop: what higher praise is possible for the Lorentz Center setup? We thank all Lorentz staff for their help and encouragement, and in particular Eline Pollaert for her unfailing assistance, at all times and hours, including weekends.

Hans van Ditmarsch (Vandoeuvre-les-Nancy, France)
Petra Hendriks (Groningen, the Netherlands)
Rineke Verbrugge (Groningen, the Netherlands)

Trusting (and) the Law

16 - 20 January 2017 @Oort

Organizing this Workshop, it was our intention to bridge the gaps between (among others) law, political science, psychology and neuroscience with regards to trust research. The interdisciplinary, international workshop week was firstly aimed at better understanding the origins of trust in the human brain and in our societies, where it has been (and continues to be) transferred into law, and where it constitutes legal systems and institutions. Legal scholars tend to take trust for granted, while social and neuroscientists tend to have a blind eye for the pivotal role of trust in legal matters. The organizers and participants feel that the workshop week was a great success, thanks to the extraordinary facilities and assistance of the Lorentz Center, which offered the perfect environment to bridge the aforementioned gap and to build on a new, cross-disciplinary and international network for future research.

The first day of the workshop was designed to further mutual understanding among the different disciplines participating. A session on the biological origins of trust in social psychology, by professors Paul van Lange (VU University) and Carsten de Dreu (Leiden University) showed how individual and social trust can be measured. Professors Jan de Keijser and Willem van Boom (both Leiden Law School) then informed the participants about legal research and the (rather superficial) way legal scholars usually perceive and use trust. A final plenary session then made the participants think about the benefits and risks of interdisciplinary research and cross-disciplinary collaboration.

The second, third, and fourth days of the workshop all started with presentations by participants, followed by a discussion, after which the participants were invited to collaborate on case studies. These case studies, performed in small groups of 4 to 6 participants each, were designed by the organizers on topics related to respectively private law and economic relationships, criminal law and the judiciary, and constitutional law and political institutions. These three fields all evoke different "trust questions", but in the process, these questions appeared to be more similar than expected. The selected cases were not to be "solved", but rather to be treated as instrumental in order to come up with new research questions and methods to further investigate these types of issues. Each day was concluded by a reporting back session, of which the results were registered by junior participants who volunteered to note the questions and findings. The participants experienced the case studies and the cross-disciplinary collaboration as highly refreshing and stimulating.

The final day offered an intense and inspiring closing session, in which the reports and experiences of the whole week were summarized and discussed. The most interesting insights and research questions were registered by the organizers for future use. This document will serve as the blueprint for a future research agenda, which will be used to apply for funding to further investigate the interconnection of trust and the law in an international network, in which almost all participants are willing to participate. Both the research agenda and the network are satisfactory outcomes of our workshop, which was set up not as an end in itself, but rather as the beginning of a new approach.

The first concrete outcome of the workshop, and also a step in the valorization of our work, was the public event "Trust in Government and in the Law", which we organized on the third workshop day (18 January), in collaboration with the Dutch Ministry of the Interior and the Council for Public Administration. Two of our participants gave a presentation, along with some external speakers, and a survey was published showing the workings of the "procedural justice" approach by local governments in the Netherlands. The event was visited by dozens of representatives from local councils and governments, as well as by fellow researchers from Leiden.

The organizers are grateful for the support of the Lorentz Center and our other funders: NIAS, LUF, the Ministry of the Interior, Leiden Law School, and the Leiden University Profile Area "Political Legitimacy". They enabled us to turn this workshop into a most pleasurable, productive, and successful experiment.

Ingrid van Biezen (Leiden, the Netherlands)
Willem van Boom (Leiden, the Netherlands)
Jan de Keijser (Leiden, the Netherlands)
Wim Voermans (Leiden, the Netherlands)
Geerten Waling (Leiden, the Netherlands)

Structured Soft Interfaces

Caught between multi-scale simulation and application

23 - 27 January 2017 @Oort

Description and aims

Advanced materials design aimed at a more sustainable use of natural resources and improved health care greatly rely on obtaining a fundamental understanding of the role of soft structured interfaces in the desired function. This workshop aimed at bringing together experts in soft matter research, from both the theoretical/computational and experimental community, to discuss peculiarities and commonalities in interfacial phenomena and explore recent advances in the theoretical/computational/experimental study of soft structured interfaces. An important goal was to provide time and a stimulating atmosphere to explore and discuss new collaborations.

Tangible outcome

The workshop was very well received by the participants, and many participants expressed some surprise about the extra-ordinary scientific level of contributions (even of PhD students). The insight that the discussions gave in tricks-of-the-trade in different flavours of computational and experimental research in this field was particularly valued, in addition to the possibility that the workshop offered to participants for private discussion with scientists of name & fame positioned somewhat out of the main line of work. Many expressed the opinion that the workshop was unique in this aspect. As a tangible outcome, roughly 50% of the participants reported the start of new projects based on knowledge gained during the workshop and/or the start of a collaboration with other participants, which were the two main goals of the workshop.

Scientific breakthrough

The participants reported several scientific breakthroughs in their private discussions during the collaborative sessions, leading to the definition of a number of new collaborative efforts. In general, a major scientific breakthrough was the realization expressed by many participants that stepping out of their comfort zone, by acknowledging and discussing issues in a particular field of research in great technical detail with experts in adjacent fields, is truly possible and valuable. As such issues are seldom discussed out in the open, being either too familiar (for specialists) or too technical (for a broad audience), they had the advantage of bringing everybody up to speed in only one week! The organizers are quite certain that the wealth of information exchanged during this week will seed several new scientific developments.

"Aha" moments

Many participants reported "aha" moments to the organizers. The key "aha" moment for the organization was the finding that the original plan, i.e. bringing together experts in this rather broad field, indeed worked as intended: that the assembled group truly greatly enjoyed the scientific talks and discussions, as well as the egalitarian way in which everything was organized. With respect to the latter, many reported to enjoy the lack of 'big ego's' among the participants.

Organization/Format

Format of the workshop. Prior to the workshop, the organizers identified a need for rebalancing the schedule, in particular the length and setup of the general discussions. We decided to shorten these sessions and to postpone them to later in the week, thus promoting a more focused discussion about the topics raised in the plenary contributions. In particular, for the purpose of collaboration, scientific input on the various subtopics was considered more important than extensive general discussion. During the evaluation at the end of the workshop, it was indeed noted that particularly the relaxed atmosphere during the Q&A following each talk was greatly appreciated and gave everybody the opportunity to directly respond to any issue of general interest. In addition, the free time in the program allowed everybody to interact, providing a firm basis for the discussion of possible collaborations. The final schedule, slimming down the long general discussion sessions to two days, was thus very successful. We found that 30 minutes oral presentations followed by 15-20 minutes discussion are most effective.

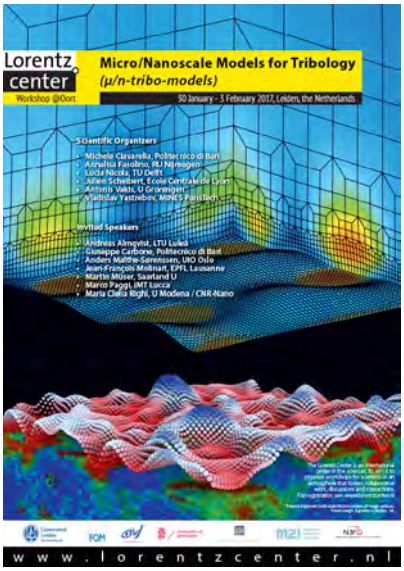
Other comments

The facilities of the Lorentz Center and the workshop dinner were greatly appreciated and contributed to the relaxed atmosphere that was felt by all participants. Communication with the LC could be improved. We recommend the instalment of a (web-based) management tool that provides up to date information on the financial status and any undertaken LC actions, to avoid miscommunication. After all, for such small workshops, the organizing committee deals with most of the communication with participants and should always have proper information at their disposal, e.g. for reimbursement purposes.

Ian Hamley (Reading, UK)
Ignacio Pagonabarraga (Barcelona, Spain)
Friederike Schmid (Mainz, Germany)
Agur Sevink (Leiden, the Netherlands)
Ryoichi Yamamoto (Kyoto, Japan)

Micro/Nanoscale Models for Tribology

30 January - 3 February 2017 @Oort



Forty leading tribologists and 20 junior researchers participated in the Lorentz Center @Oort workshop on "Micro/Nanoscale Models for Tribology" held in Leiden between 30 January and 3 February 2017. Participants came from 14 different counties (13 countries in Europe plus Japan) with a 9:1 ratio of academia to industry and 85% being (predominantly) modelers and theoreticians versus 15% being (predominantly) experimentalists.

The makeup of this select group comprising applied physicists, materials scientists and engineers, resulted in lively discussions over a broad range of topics relevant to tribology, facilitated via 7 keynote lectures and 16 round-table discussion sessions. The expected outcomes of the workshop are: a review of the state-of-the-art in tribological research, a proposed research roadmap for the next 5-10 years, the establishment of an interdisciplinary network of scientists and engineers working on tribology in Europe to be facilitated via a collaborative platform, and the possibility of submitting collaborative proposals via COST Action or Marie-Curie ITN calls.

The workshop was organized thematically across five days: multiscale and multiphysics aspects, rough surface representations, analytical models, microscale models, and nanoscale models. The breakdown of continuum theories was discussed especially with reference to the nano- and microscale. Experimental aspects were addressed each day in dedicated sessions to provide grounding for the discussions via empirical observations. Each of the invited participants co-chaired a round-table discussion session during which the state-of-the-art was briefly presented and research questions were raised and discussed interactively, for example, motivated by brief presentations. By design, all participants could attend all sessions (there were no sessions held concurrently) to facilitate the aim of the workshop to bridge the gap between the applied physics, materials science and engineering fields represented by the participants. Furthermore, poster sessions gave the opportunity to junior participants to present their work, and engage in discussion with more senior scientists, while industrial participants presented the tribological problems encountered by their companies.

Critical topics in tribology were not confined to a specific session but addressed recurrently during the week. One of the main outcomes of the workshop was the realization that, despite the modeling community's ability to address elastic problems of great complexity at various scales, significant effort is still required to account for the effects of plasticity, adhesion, friction, wear, lubrication and surface chemistry in tribological models. Weak, strong and monolithic coupling schemes between different physical phenomena at small scales, which are critical for tribological behavior at the system scale, were considered during respective round-table and key-note lectures. Numerical methods were also discussed relative to their inherent length scales: finite element and boundary element methods versus discrete dislocation dynamics for the microscale, and classical versus ab initio molecular dynamics and density functional theory for the nanoscale. Emphasis was placed on the advantages and disadvantages of employing concurrent or hierarchical multiscale schemes coupling these methods, while the need to develop improved tools requiring less computational effort and time was put forth by industrial participants who would like to use such tools to optimize and control their processes and products. All these issues constitute future areas for tribological research and have been made visible to participants who expressed their interest in pursuing this further in an inter-disciplinary manner.

Michele Ciavarella (Bari, Italy)
Annalisa Fasolino (Nijmegen, the Netherlands)
Lucia Nicola (Delft, the Netherlands)
Julien Scheibert (Lyon, France)
Antonis Vakis (Groningen, the Netherlands)
Vladislav Yastrebov (Paris, France)

Spaces and Places of Religious Knowledge Transfer in Early Modern Cities

Developing New Methods for Historical Research and Analysis

30 January - 2 February 2017 @Snellius

The workshop aimed to **innovate historical research** into the early modern period (c. 1400-c. 1600) by the further development of "Space and Place", most notably "Spaces and Places of (Religious) Knowledge Transfer", as a multidisciplinary approach for historical research and analysis and by fostering an exchange between the newest perspectives in spatial theory and historical research. An essential step in this process has been the exchange with researchers specialized in digital mapping and Historical GIS as a research and teaching tool enabling to uncover the spatial and kinetic dimensions of early modern cities. Based on the discussions of the colloquium, the participants have drawn an **innovative, multi-, interdisciplinary and transnational research agenda and collaborative research initiative** crossing traditional disciplinary boundaries, connecting Dutch and European historians with researchers from the fields of spatial sciences and social sciences

The workshop included 14 speakers and 2 master classes for PhD students. Each presentation was followed by a lively discussion where the participants further elaborated their ideas and approaches. The general conclusions were:

- the importance of social theory, social network theory, Actor-Network Theory, especially the inclusion of physical spaces as actors in networks;
- the importance of further elaborating philosophies of space (Foucault, Bourdieu, Jacob) and their relations to knowledge and knowledge transfer;
- a profound conceptual and technical reflection on both historical maps, modern mappings, "counter mapping", virtual reconstructions, and computer-based data modelling;
- the importance of further collaboration between historians, social scientists, philosophy and computer-based data analysis, as a means for the further development of GeoHumanities.

The first tangible outcome of the workshop is the submission of a bid for the NWO Internationalization in the Humanities grants: "Navigating Spaces: Knowledge Flows in Early Modern European Cityscapes" (submitted 2 March 2017). All participants in the Lorentz Workshop are convinced of the importance of continuing the collaboration. If funded the international research network will unite at least 28 participants coming from 11 European countries. Next to the NWO funds, the partners have offered to finance activities to a total amount of 25,000 EUR showing to wat extent this research initiative is important to a large group of researchers. In the unlikely event that the NWO bid will not be honored, the participants agree about the importance and urgency of spatial approaches in the Humanities and they all endorse the intention to organize a follow up conference (possibly a KNAW symposium)

The workshop has moreover marked the beginning of a scientific breakthrough: the acknowledgement of the value of space and place as theoretical and methodological assets for a true pan-European transdisciplinary research. By starting from an analysis and discussion of the theoretical backgrounds of the participants, the workshop has led to a refinement of research approaches while showing the potential of spatial approaches for innovation and collaboration in historical studies. The multidisciplinary collaboration that has started during the workshop will significantly impact research lines and perspectives of the participants and will in particular have a strong impact on the early

career researchers taking part in the master classes (a Marie Curie Individual Fellowship based on the suggested methodological approaches in this moment in preparation at the University of Groningen).

The format of the workshop was excellent and it allowed formal and informal exchange in a stimulating environment and well-organized location. All participants were hugely impressed by the facilities offered by the Lorentz symposium, as well as the social and scientific interaction fostered by the open atmosphere of the premises. Several of them have picked up an information leaflet and they consider applying for a Lorentz symposium as well. The possibility to access a computer lab or the presence of further computing facilities (besides the laptop for projection and presentation) would have further stimulated the exchange with data scientist and digital specialists and the testing of digital applications.

Sabrina Corbellini (Groningen, the Netherlands)
Margriet Hoogvliet (Groningen, the Netherlands)
Keith Lilley (Belfast, Ireland)

Path Integration in Complex Dynamical Systems

6 - 10 February 2017 @Oort

Description and aims

The aim of this workshop was to bring together theorists and phenomenologists who actively use path-integral methods in their research, and via carefully selected lectures stimulate exchange of opinions and dissemination of new ideas and state-of-the-art applications. The workshop covered modern topics in which path integrals play an indispensable or decisive role. A structural backbone of the workshop was given by four benchmark topics:

a. Econophysics and heavy-tailed systems,
b. Hard and soft condensed matter theory and biophysics,
c. Quantum gravity,
d. Foundational issues in natural and mathematical sciences

Tangible outcome

We expect that in the coming years, a number of papers will be published which will owe significantly to the workshop. Apart these prospective papers, the workshop organizers together with key-note speakers plan to write a report paper (probably in Annals of Physics) on the present state-of-the-art applications of path integrals.
Scientific Breakthrough? So far, it is perhaps too early to speak about scientific breakthroughs. One might modestly state that the workshop invoked and provoked a number of interdisciplinary questions among participants. This could be clearly seen during discussion breaks every day. We could also observe that new collaborations have been established.

"Aha" moments

Yes, cross-fertilization among separate scientific communities could be clearly seen. As already mentioned, the discussion breaks were quite instrumental in finding a unifying language and in experiencing "Aha" moments among participant with different specializations. Personally, we have experienced a number of "Aha" moments, for instance;

- when Prof G. Junker was able to show that the "local-time" path integral used by Dr V. Zatloukal can be understand as "path-integral power-law duality" in disguise,
- when Prof J. Klauder proposed to Dr. L. Smaldone a new way of looking on canonical transformations in phase-space path integrals via complex canonical transformations in cohere-state path integrals
- when Dr. P. Ribeiro in the discussion session discussed his current research difficulties involving operator ordering issues within the path integral formulation and Prof. J. Klauder could shed new light on the issue and Prof. A. Abanov could show that the ambiguity does not make a difference.

Organization/Format part of the report:

Format of the workshop

We did not experiment much with the workshop format. We adhered rather strictly to the proposed program. We have found that 5 longer lectures (45 to 60 minutes) per day furnished with two-hour discussion per day represented a very stimulating scientific milieu. Most likely, we would follow a similar format during possible future LC workshop.

Other comments. Right from the start when we submitted our proposal to LC we felt enjoyed the professional and collegial atmosphere of the Lorentz Center. Finally, it was an absolute pleasure to spend the conference week at LC. The workshop coordinator, Aimée Reinards, made all the participants feel looked after and she worked closely with us (the scientific organizers) to make the workshop a success.

Petr Jizba (Praha, Czech Republic)
Stefan Kirchner (Hangzhou, China)
Lawrence Schulman (Potsdam, NY, USA)
Jan Zaanen (Leiden, The Netherlands)

Quantum Spacetime and the Renormalization Group

13 - 17 February 2017 @Oort

Quantum Gravity research explores physics beyond the well-established standard models of particle physics and cosmology. It aims at reconciling the laws of quantum mechanics, governing physics at the (sub-)atomic scales, with general relativity, describing the gravitational force at macroscopic scales. During the last years there has been a growing awareness throughout the quantum gravity community that renormalization group techniques may constitute a crucial element in achieving this goal. On this basis, the workshop has critically reviewed the most pressing conceptual questions in asymptotic safety and neighboring fields. Furthermore, strategies for connecting quantum gravity to observable signatures in astrophysics, cosmology, and particle physics have been discussed.

The workshop succeeded in bringing together many of the leading experts on quantum gravity, particle physics phenomenology, and cosmology. The size of the workshop also allowed the participation of a substantial number of young researchers just completing their Ph.D. or being on their first postdoctoral appointment. The format consisted in short, "to-the-point" presentations followed by lively discussions. The idea of encouraging speakers to make controversial statements during their presentations worked very well in a two-fold sense: the statements provided seeds for subsequent discussions and gave the speakers the opportunity to voice more speculative viewpoints beyond the scope of published material. Moreover, the poster flash session quickly integrated the young researchers in the scientific exchange. The format of the workshop purposefully included ample time for scientific discussions during the plenary sessions. The afternoon program reserved time-slots for "new collaborations meetings" focusing on scientific exchange in smaller groups. In the friendly atmosphere provided by the Lorentz Center, this provided a successful seedbed for developing novel ideas on how to address open questions in future research.

Renormalization group methods in quantum gravity are currently a rapidly developing research field where the final rules of the game are not cast in stone yet. The open, respectful, and constructive atmosphere at the workshop played an essential role in forging a common scientific basis among the participants. On this ground the scientific focus quickly centered on three main themes: fundamental questions, methodological advances, and possible connections to observable physics. The roadmap sessions scheduled during the last day catalyzed these developments into a concrete vision for future research. Witnessing the intense discussions throughout the workshop, there were quite frequent "Aha"-moments among all the participants ranging from "Oh, this is what you are actually doing!" over "Now, I see the link between these two approaches.", up to "This is interesting. Let's make this a common research project." Thus the workshop met all the expectations of the organizers as well as the participants: it succeeded in forging closer connections between different approaches to quantum gravity research, even resulting in very concrete suggestions for future research projects.
Most notably, many participants considered the workshop as "the most important one that they had been to in the last year". Moreover, there was a lot of encouragement from senior scientists to continue this form of dialogue within the same format. In particular, there is the concrete offer to hold a similar event at CP3 origins (Denmark) in the near future.

Dario Benedetti (Paris, France)
Astrid Eichhorn (Heidelberg, Germany)
Frank Saueressig (Nijmegen, Netherlands)

The Formation of the Solar System and the Origin of Life

20 - 24 February 2017 @Oort

The recent discovery of more than 3000 exoplanets in the last three decades have demonstrated that planetary systems are not only common, but also immensely diverse. This naturally raises the questions how our Solar System formed and how life developed. These are the most important scientific questions motivating our workshop. Answering these questions is not straightforward. Since 4.6 billion years have passed since the formation event, one has to rely on various clues to constraint the answer, which in turn requires an interdisciplinary effort.

The interdisciplinary workshop "Formation of the solar system and the origin of life" took place at the Lorentz Center from 20--24 February 2017. It brought together around 55 international participants from four major different research fields: astronomy, biology, geology, and chemistry. Due to the dramatic differences among participants' research fields, we encouraged to discuss in a central theme with understandable languages. As such, the workshop featured a daily theme initialized by two keynote speakers, followed by shorter contributed talks and small group discussions. The small groups were established randomly (for example by the birth month of the participants), ensuring the diverse backgrounds and career stages of the group members. Furthermore, instead of having the most senior participant in the small group moderating the discussion, we invited the most junior participant to do this job and give a summary report following the discussion. We believe that this gives junior researchers more opportunities to talk and present themselves.

We experienced several "aha-erlebnis" moments during the discussion. These realizations, together with many other comments, questions and possible answers, are written down in a Google document on-the-fly during the discussion.

We discussed, for example, the importance and definitions of biomarkers (and anti-biomarkers). These are addressed across different fields from various perspectives. The questions raised potentially lead to collaborations among the participants in the near future. We believe that the main tangible outcome is that participants from different disciplines learn to communicate more effectively and about the main questions, topics, and methods of the various fields. This led to identification of common grounds and gaps in between the disciplines. We also discussed sharing and transferring working methods among the different disciplines. For example, GPU programming widely used in astrophysics would be extremely helpful in theoretical biology, where on the other hand there is much deeper knowledge of "big data" analysis and algorithms lacking in astronomy.

Based on notes made collaboratively on-the-fly during these discussions, we plan to publish a paper summarizing the outcomes of this workshop. We also hope to be able to use the facilities of the Lorentz Center again when we plan on a follow-up interdisciplinary workshop on the evolution of the solar system and the origin of life.

Maxwell Cai (Leiden, The Netherlands)
Lucie Jilkova (Leiden, The Netherlands)
Susanne Pfalzner (Bonn, Germany)
Simon Portegies Zwart (Leiden, The Netherlands)

Common Threads in the Electronic Phase Diagram of Unconventional Superconductors

27 February - 3 March 2017 @Oort

Description and aim

Last few years have been exceptionally prolific for superconductivity, with the discoveries of several new materials classes, inventive heterostructures, novel tuning parameters, new intertwined phases, and strange metals with or without a critical point at the superconducting dome. These discoveries have led to new insights which have revived some of the earlier understandings. A basic theme of the workshop was to explore and unify the common properties, combining both earlier and recent results, displayed in all classes of unconventional superconductors including copper-oxides, heavy-fermions, organics, newly discovered iron-pnictide, chalcogenides, and various heterostructures.

Organization/Format

In our workshop, we aimed to bring some order in the new landscape though teaching each other about our "niches", and by then discussing in groups and in the plenary about the big picture. We concentrated on the common threads that emerge in all families of new superconductors.

We started by exploring new experimental methods and tunabilities which can enable to individually control the correlated physics and superconductivity with the goal to illuminate how their interplay results in strong Cooper pairing. Experts from all fields discusses on designing focused experiments which can be carried out in all materials families so that common and important features can be unraveled. Substantial emphasis was given to utilize the recently developed high-resolution spectroscopies, and multifaceted sample preparation techniques, and multiple tunings methods.

An equal focus was given to the theoretical aspects of both electronic correlation and superconductivity where existing approaches based on strong coupling or weak coupling theories are challenged. A question of general interests is why and how superconductivity often emerges near the boundary between the strong coupling, local and weak coupling, Fermi-liquid like regimes with the cooperation of enhanced non-Fermi liquid physics. We have discussed several newly developed theories for the non-Fermi liquid or strange metal physics without tuning the materials to a quantum critical point. Intermediate coupling (where electronic interaction strength is of the order of bandwidth) models for correlated superconductors, recently observed charge density wave, pair density wave, nematic order for superconductivity, and others will be discussed and confronted with experiments. Given the diversity and versatility of the field, focused and well-defined problems are identified where collaborations between experiment and theory can be build and strengthened.

Outcome

The workshop was a success in terms of achieving these goals. In particular, we have discussed in depth that the Non-Fermi liquid behavior is a generic and common parameter which precedes superconductivity in all families of superconductors. This conclusion was achieved after sifting through gamut of experimental data and discussions. It was appreciated by all participants and took it as a focus research topic in the future. We had break-out discussions which were enjoyable and fruitful. All talks were also distributed as 30 minutes talks and 15 minutes discussion. The talks were also informal with

lots of discussion throughout the talks. All participants were very happy the format of the program, and enjoyed experimenting with new ways of discussing.

It was a very nice and fruitful week, and we are very grateful for the tremendous enthusiasm the participants brought to the workshop!

Milan Allan (Leiden, the Netherlands)
Tanmoy Das (Bangalore, India)
Nigel Hussey (Nijmegen, the Netherlands)
Christos Panagopoulos (Singapore, Singapore)
Jan Zaanen (Leiden, the Netherlands)

KK-theory, gauge theory and topological phases

School week, 27 February - 3 March 2017 @Snellius
Workshop week, 6 - 10 March 2017 @Oort

This two-week program consisted of a one-week school and, subsequently, a one-week workshop on new developments in Kasparov theory (also referred to as KK-theory) motivated by applications to gauge theory and topological phases of matter.

School week

There were three main short courses, each of which was taught by two experts of the subject. The aim of these lectures was to get everyone "up to speed" for the upcoming Workshop, and they served this purpose excellently, providing very clear expositions on the subjects of the program. Each day of the School concluded with a discussion session, where the participants were invited to raise their doubts about the lectures, or to ask for clarifications regarding some of the points that were raised during them. This favoured a thorough understanding of the subjects taught, as well as the possibility to debate the physical motivations and applications for the mathematical tools that were illustrated and developed in the courses.

Workshop week

The five-days Workshop followed the School and built on the topics introduced there. Elaborating on the material presented in the School, the newest uses of KK-theory in index theory, gauge theories and topological phases of quantum matter were illustrated by leading experts. The speakers reported on cutting-edge research, recently developed in the fields of interest to the program. The more topical advancements and applications of KK-theory were debated both alongside the presentations and during dedicated discussion sessions, which served as well as a means to outline future lines of investigation for the communities which came together during this program. Several topics were discussed in these sessions, like implications of the theoretical models, possible predictions and challenges for the physics community, but also more technical aspects related to the unbounded Kasparov product.

Acknowledgements

The organizers thank all participants and particularly Francesca Arici and Domenico Monaco for their accurate and complete overview of the meeting forming the base of this short report. The organizational support of the Lorentz Center was excellent, leaving essentially only research problems for the organizers.

Alan Carey (Australian National University)
Steve Rosenberg (Boston University)
Walter D. van Suijlekom (Radboud University Nijmegen)

Observations and Theory of Quasar Outflows

6 - 10 March 2017 @Snellius

Active Galaxies drive powerful outflows to outer regions of their host galaxies. There is nowadays a realm of data that is revealing new aspects of the Quasar outflow phenomenon that are not completely covered by theoretical work, and that prompts for a more complete synergy between experts on observational data and theorists. The goal of this workshop was to bring together key experts on AGN outflows and to foster fruitful interaction between the two communities. The workshop was also intended to bring together experts in multi-band observations of Quasar outflows so to avoid that relevant results and open issues stay confined within a single-wavelength community. The following open questions were discussed:

- observational tests of energy conserving wind models;
- properties of complex soft X-ray ultra-fast outflows;
- feedback in low luminosity AGN;
- coincidence of X-ray and radio outflows;
- physical connection of multi-phase outflows.

The goal of putting in contact experts of contiguous fields was successfully achieved and thanks to the format of the workshop there was plenty of time to communicate not only results, but also doubts and problems on particular aspects regarding the state of the art in the Quasar outflows field. Fundamental questions have continuously arisen and people discussed them very enthusiastically. In terms of "Aha" moments, we noticed that experts in theory were positively impressed by discovering in observers' talks that their theoretical models were employed to explain a certain data set. We also noticed that the possibility to detect signatures of shocked outflows in observations of compact radio jets sparked great interest and was intensively discussed during the last 2 days of the workshop.

Along the 4 days, 5 sessions were organized to cover the main topics. Each participant gave a talk and at the end of each session a general summary/discussion was led by 2 designated participants who introduced a short presentation illustrating questions and issues that were prompted by talks throughout the session. The schedule of the workshop was kept very flexible and the discussion flow after each presentation was not interrupted unless strict time limitation forced to do so (e.g. lunch time, social dinner), so that everybody who had something to say about a certain topic was free to share his/her view before all audience. Talks could be postponed if discussion was particularly active at chair people discretion. In this way we guaranteed a lively and informal flow of ideas without being tied to a strict schedule. This feature was highly liked by all participants, many of which explicitly told organizers that this was one of the best workshop they attended because the small size (~30 people), the variety of expertises and the free format actually allowed scientific discussion to dig deeper into questions and, at the same time, interaction with experts to be easier and informal, especially for junior participants. People also enjoyed very much the possibility of having their own space and office and several splinter meetings took place during which observing proposals, scientific papers and future collaborations have been discussed. I am personally aware of at least two observing proposals that were discussed and planned during the workshop: one successful proposal to the NOEMA interferometer and another one submitted to HST.

Yair Krongold Herrera (Mexico City, Mexico)
Anna Lia Longinotti (Puebla, Mexico)
Francesca Panessa (Rome, Italy)
Daniel Proga (Las Vegas, NV, USA)

Emerging Applications of Data Assimilation in the Geosciences

13 - 17 March 2017 @Oort

Emerging Applications of Data Assimilation in the Geosciences Goal

The goal of this workshop was to bring together experts on data assimilation, Bayesian statistics, seismology, and (paleo-)climatology to exchange knowledge, suggest new data-assimilation methods suitable for applications in each field, and to stimulate future collaborations. Data assimilation is a well-established methodology in meteorology to estimate the complex behaviour of a dynamical system using available data. Seismology and climatology share the same goal as meteorology though the mathematical methods differ depending on each field due to limited data, models, and computing power. With improvement of models and wider availability of data the traditional distinction between these fields is, however, blurring, and considerable convergence can be observed. Moreover, the current increase of computing power allows to quantify the uncertainty of an estimate using Bayesian statistics, which serves as a unifying framework for data assimilation in all fields.

Focus Groups

The presentations and discussions during the week where organized around four overarching themes: *Formulating the Prior, Model-Data Mismatch, Uncertainty Quantification, and Joint Parameter and State Estimation*. Below are brief summaries of the outcomes of each focus group.

Formulating the Prior

The prior probability density function encodes the prior assumptions on the quantity we are estimating. It plays different roles in (paleo-)climatology and seismology. In seismology, due to the iterative nature of the data assimilation algorithms, the prior refers to the initial prior information about the parameters. In climatology, data assimilation algorithms are sequential and the prior mainly refers to the updated posterior. Moreover, due to the ill-posed nature of the inverse problem in seismology, so-called regularization terms are added to force a unique solution. The choice of regularization is often dictated by the availability of efficient data assimilation algorithms rather than realistic assumptions on the parameters. In climatology, the chaotic nature of the system results in a rather quick memory loss of the initial prior and thus perturbation of the updated posterior using for example simple inflation is more essential, which could be replaced by a recent employment of non-informativ e priors in data assimilation. For some applications, such as paleoclimate, the Lyapunov time could be rather long and thus sophisticated perturbations, such as breeding, are required. Another avenue of investigation that came up is the use of techniques from machine-learning to distill priors in data-rich problems or based on more sophisticated (fine resolution) models.

Model-Data Mismatch

Quantifying the mismatch between the predictions and observations is relevant in both (paleo-) climatology and seismology. In seismology, the primary goal is to identify features that lead to a simple relation between the parameters of interest and some observations. An example is the travel-time of a

certain wave from their source to the location where observations are obtained. In (paleo-)climatology, the first concern is to incorporate any biases introduced while acquiring or processing the observations. During the discussion some common problems were identified. How to identify features in the observations that are optimally sensitive to parameters of interest is an open question. Transparency and reproducibility when processing the data was also identified as an important issue.

Uncertainty Quantification

Quantifying the uncertainty (UQ) in the (best) estimate is of crucial importance when interpreting the results. The Bayesian point-of-view provides a natural framework to think about uncertainty. We can identify several sources of uncertainty, such as measurement errors, modelling errors and the inherent non-uniqueness of the inverse problem. The relative importance of these various contributing factors differs per application, leading to distinct approaches for UQ in each field. In (paleo-)climatology, measurement and modelling errors are most prominent. Using a purely Bayesian framework, estimates of the uncertainty follow naturally. In seismology, the inherent non-uniqueness is the biggest problem and uncertainty is usually formulated in terms of the resolution of the final image. Porting the Bayesian interpretation of uncertainty to seismology is challenging because of the bias introduced by the problem formulation (prior and likelihood). Quantifying the influence of the choice of prior/likelihood is identified as a highly relevant open question.

Joint Parameter and State Estimation

Estimation of the parameters and states jointly can be formulated in a common framework. Starting from this generic formulation, various existing approaches can be derived and compared. In both seismology and (paleo-)climatology there is interested in extended current methodologies in this direction. Several participants have expressed interest in drafting a review paper on this subject.

Outcomes

- Planned review paper on joint parameter and state estimation.
- Several investigative collaborations.
- Emerging interest in seismology of sharing and combining fine regional models in order to produce a 'Collaborative Seismic Earth Model' could profit from the climatological community where such collaborations are well established.
- Multi-model approach (similar to an Ensemble Kalman Filter) used in climatology could be applied in seismology as well in order to obtain successive model updates, including uncertainties.
- Improvement in the comparison of model estimations and observations in paleoclimatology is inspired by the sophisticated methods applied in seismology to isolate the most useful signal.
- Automatic quality control of the input data in paleoclimatology could be based on the expertise developed in other fields.

Svetlana Dubinkina (Amsterdam, The Netherlands)
Andreas Fichtner (Zürich, Switzerland)
Hugues Goosse (Leuven, Belgium)
Peter Jan van Leeuwen (Reading, UK)
Tristan van Leeuwen (Utrecht, The Netherlands)

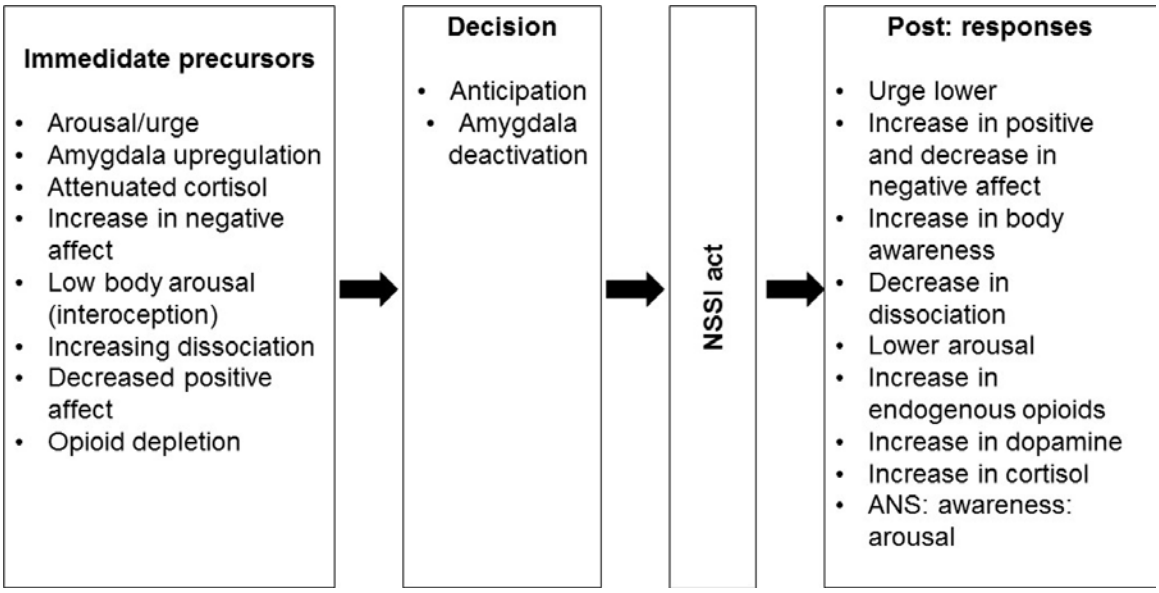
Creating a neurobiological model of Nonsuicidal Self-Injury

13 - 15 March 2017 @Snellius

The primary aim of the workshop was to develop an understanding of the neurobiology of Nonsuicidal Self-Injury (NSSI) by bridging gaps between diverse fields of neurobiological research and bringing together researchers with different expertise. We further aimed at creating hypotheses for future research based on a joint model, laying out a road map for future research.

The workshop included 19 participants with eight participants from Germany (including two organizers and two PhD candidates), nine participants from the US (including one organizer and two PhD candidates), one participant from Belgium and one from the UK. Participants´ methodological expertise included: neuroimaging, neurotransmitter research, animal models, psychological models, social network modelling and pain research.

The workshop included both brief introduction into the latest research activity of the participants, as well as break out groups to discuss controversial topics in NSSI research such as addictive properties of NSSI. Especially with regards to pain models and dopaminergic neurotransmission as a maintaining factor in NSSI, models from animal research provided a fresh perspective to common viewpoints which were based mainly on psychological and neuroimaging research. We further discussed methodological questions in specialized out-break groups. By introducing several viewpoints of neurobiological and psychological understanding of NSSI, we were able to describe a joint understanding of processes involved in NSSI, which have been described so far (see graph 1). This is, however, preliminary work, as the field of NSSI research and our understanding of the involved mechanisms is rapidly evolving, thus adding new layers of understanding to this model.



Graph 1: Developing an understanding of the underlying neurobiological and psychological processes involved in NSSI

To foster our aim of creating a road map for future research, the group developed the idea of creating a standard assessment battery - both for psychological research and for considering neurobiological paradigms - to come up with comparable study results from different groups in future research activities. The results of these two groups (psychological assessment and neurobiological assessment) will be published in the open access journal "Borderline Personality and Emotion Dysregulation" (editor in chief: Christian Schmahl).

During our discussion, we identified several areas in need of further research, especially concerning neurobiological processes. This included (but were not restricted to):

- Development of pain sensitivity during "normal" development (especially with regards to gender differences)
- The role of seeing blood in NSSI (using fMRI paradigms)
- Neurobiological impact of child-abuse-neglect or trauma history on NSSI
- Dysregulation at intersections of neurotransmitters-brain (e.g. HPA axis, stress response, brain activity) in NSSI

Unfortunately, we missed expertise on genetics, as several researchers with an expertise in genetics from the Netherlands and the US were invited but cancelled their participation. However, in summary, we were able to reach our aims of developing both a joint understanding of the current knowledge of the neurobiology of NSSI and develop directions for future research based on a more standardized assessment of NSSI related variables in different centers. The workshop itself provided an excellent opportunity to create communication between different highly active research groups.

Jennifer J. Muehlenkamp (Eau-Claire, WI, USA)
Christian Schmahl (Mannheim, Germany)
Paul L. Plener (Ulm, Germany)

Challenges for the regulation of gene drive technology

20 - 24 March 2017 @Oort

Description and aim

This international workshop enabled a knowledge-based discussion about gene-drive (GD) applications. In a normal Mendelian mode genes are typically inherited to 50% of the offspring. GDs increase their representation in the next generation to 60% or even to 100%. With new methods in gene editing like CRISPS-Cas9 it is now possible to introduce these GDs into wild populations after which they may increase in frequency on their own. Potentially the new techniques offer great benefits for society when it comes to pest and disease control, but there are also environmental risks. How can regulators best anticipate these challenges? The workshop brought together scientists from various disciplines. Our approach was general but there was special interest for control of mosquitos and malaria, since this is likely to be the first application of GD technology in nature.

Before any GMO can be released into the environment it is subject to an Environmental Risk Assessment (ERA). The ERA develops hypotheses of what can happen under different scenarios. These hypotheses will guide the type of data that need to be collected before the release. Constructing hypotheses of what might happen requires input from several fields; molecular biology, genetics and ecology. Acceptance (or rejection) of the new techniques requires full clarity about research goals and also input from social sciences.

The workshop

In total 53 participants participated representing a wide range of Technology Developers (Small & Medium Enterprises, Industry), Technology Users (from Europe, South America, and Africa), Regulators (including Risk Assessors and Risk Managers), Scientific Community (from disciplines of Ecology, Mathematical Modelling, Population Genetics, Molecular Biology) and Governance (representing Ethics, Politics, and Socio-Economy). After three days of lectures with discussion, we organized a meeting using Open Space Technology. This concept comes from the business world. The participants make their own agenda and working groups.

Outcome

Definition of GD

GD is biased inheritance of specific alleles. The genetic mechanism is active during meiosis or after the embryo is formed. GDs can be geographically restricted to local areas and populations (Local Drive - LD) or not (Non-LD). Not all GDs increase in frequency after introduction in natural populations and the conditions for spread were established mathematically.

Predict the technological developments in the next years

The estimated first year of field release of a GD for control of malaria in Burkina Faso is 2026-2035. Dengue/Zika 2026 - 2030, Schistosomiasis 2033 - 2036, Lyme/tick-borne diseases 2028. GDs that target Invasive animals (e.g. rats, cats, mice, cane toads) are projected for 2025 - 2030.

Knowledge gaps
It was an eye opener that the field of GD was much broader that the CRISPR Cas9 techniques that are now in the public spotlight. Different models apply to these systems but often the spread of GDs is frequency dependent, a certain threshold is required for their spread. This concept is important for developing regulation. The picture of GD in the media was that a single introduction could spread over the entire global population of a species. After the meeting there was a more realistic picture. We can identify conditions that promote and limit the spread, making regulation feasible. In the Open Space, 17 working groups were set up which varied from "Public consultation and what to do with it?" to "Foretelling risks to GD 10 years from now".

Develop hypotheses of what might happen after the introduction of Genetically Modified Organisms with gene GD in the environment
As key terms we identified population suppression vs. alteration, thresholds for spread of GDs, selfsustaining (yes/no), selfexhausting vs. self-limiting

Create awareness about benefits and risks of the new techniques and connect our ideas to current regulation, ethical aspects and decision making
The working groups in the Open Space led to five Action Groups. 1) Encouraging Open, Trustworthy GD Research. 2) EU harmonization on RA for contained Use of GD. 3) Draft Capacity Building Strategy on GD for Africa. 4) E-mail Survey on Definitions of Terms, 5) Change paradigms to include Risk/benefits.

General conclusions

Hypotheses of what might happen to GD sin the environment have become much clearer, to the advantage of both scientist who develop GDs and regulators who need the imply the technology in a way that is 100% safe. The atmosphere was very positive, as was reporting on the workshop in the Dutch media (Bionieuws, NRC). Currently the organizers work on publishing a general overview of the workshop and on specific aspects.

Acknowledgement

We are very grateful to the Lorentz Center for great supports to our workshop, especially Martijn Fritsen. We thank all participants for their contributions to the workshop, all the brilliant ideas in the presentations of the speakers and during the discussion sessions. We thank Ad van Roosmalen and Doris Gottlieb for the preparation and assistance during the 'Open Space Event' in the workshop. In addition to central funding by NWO to the Lorentz Center, the workshop was financially supported by the Commissie Genetische Modificatie (COGEM) of the Netherlands, Institute of Biology Leiden and the German Federal Office for Consumer Protection and Food Safety (BVL).

Detlef Bartsch (Berlin, Germany)
Mike Bonsall (Oxford, UK)
Tom de Jong (Leiden, the Netherlands)
Werner Schenkel (Berlin, Germany)

A Bayesian View on the Galactic Magnetic Field

From Faraday Rotation to Ultra-High Energy Cosmic Ray Deflections

20 - 24 March 2017 @Snellius

This workshop was an essential step in the ambitious goal to define a realistic model of the strength and structure of the magnetic field in our Galaxy, the Milky Way. A novel part in our approach is hereby to include the information provided by the arrival directions of ultra-high energy cosmic rays (UHECR), for which the Galactic magnetic field (GMF) acts like a distortion lens, blurring the image of their extragalactic source positions.

A crucial component in this endeavor is the development of a software package for sampling of the likelihood function on the parameter space of user-defined GMF models, called IMAGINE. When organizing this workshop, a beta-version of IMAGINE was taking shape.

The goal of this workshop was to define and initiate scientific applications of IMAGINE, to prepare it for general use by the community. To this end, the workshop brought together representatives of all communities that can benefit from and/or contribute to IMAGINE:

- Galactic astronomers working on the interstellar medium and magnetism,
- astroparticle physicists interested in sources, propagation and detection of cosmic rays,
- experts in Bayesian methods. In addition to these key areas, also related fields like cosmological largescale structure formation or Galactic cosmic ray properties were discussed.

On the first day of the workshop, we introduced the philosophy, goal and status of IMAGINE to the workshop participants. For the rest of the week, the participants presented their own related work or plans in the morning, interspersed with tutorial-style talks about the various research areas to bring participants of the different communities on level. The afternoons were mostly spent in discussion sessions - we had planned break-out sessions in smaller groups, but when it appeared that everybody was interested in every topic, all discussions were converted to plenary. This emphasized the high interest in scientific exchange among the involved communities, and can be regarded a first success of the workshop. Two main tangible results have come out of the workshop: we have officially set up the IMAGINE consortium, and we are writing a white paper about the project. In addition, smaller groups will start or continue working on various special subjects related to the main tasks, such as:

- developing a realistic GMF model based on magneto-hydrodynamical dynamo equations
- investigating the strength and structure of random fields in the Galaxy and their impact on cosmic ray propagation
- estimating the distance to and extent of large-scale field reversals in the Galactic disk

Although we did not use some of the opportunities the Lorentz Center offers to support splinter sessions, the generous supply of individual workspace and areas of retreat has been appreciated by all participants. We also thank the Lorentz Center team for their excellent support in setting up team-building social activities, which have greatly contributed to the success of our workshop. We can imagine to return to the Lorentz Center, maybe within a somewhat bigger setting @Oort, once our initiative bears scientific fruit.

Torsten Enßlin (Garching, Germany)
Marijke Haverkorn (Nijmegen, Netherlands)
Jörg Hörandel (Nijmegen, Netherlands)
Jörg Rachen (Nijmegen, Netherlands)
Anvar Shukurov (Newcastle, United Kingdom)

Computational Ethnomusicology

Methodologies for a new Field

27 - 31 March 2017 @Oort

The semantic gap between fields in humanities and computer science significantly impedes the development of shared research methodologies for music research. In this workshop we took a step forward towards such methodologies for computational approaches to the study of music by bringing together two fields with widely divergent methodologies but often shared goals: Music Information Retrieval and Ethnomusicology. Some of our main goals were the formation of new, genuinely interdisciplinary collaborations, an increased understanding of disciplinary differences, an understanding of the limitations of computational approaches, and the stimulation of interdisciplinary research proposals.

This workshop provided us the opportunity to assemble a participant group with mixed backgrounds, which is hard to organize otherwise. During the mornings, we organized lectures and plenary discussions, and during the afternoons, we split up in smaller working groups to address issues of particular interest for the participants. At the end of the day, we had a 'reporting back' session from the working groups.

During the workshop a continuous effort was made to document the gaps between the involved fields and to present strategies of how to bridge these by means of interdisciplinary work. As a major insight, it was understood that such gaps are the consequences of differing thought processes in the involved fields, and that instead of attempting to eliminate such gaps it would be a more fruitful attempt to work with them and to take advantage of differing methodologies when approaching research questions.

We advanced to documenting the gaps and our common interests in the form of a common wordpress site[1] that will document the thoughts that emerged out of the workshop. We began the documentation by listing participants and their interests, existing archives, and by initiating a glossary that clarifies differences in how common terms are interpreted differently in the involved fields.

Potential areas for scientific breakthroughs were identified by discussing in which research questions the collaboration between fields could yield insights that were not possible without it. In specific, we identified the incorporation of computational analysis into archiving systems, the study of larger corpora of recorded and notated music, and the development of visualization tools for specific properties of music.

The focus on working groups enabled us to discuss between fields and to understand differences in approaches to music. From these discussions, some very important insights emerged in how far we conceptualize specific notions such as "model" or "ontology" in different ways. The selected presentations centered around specific focus areas and successfully stimulated the discussions. We believe the workshop was a catalyst for the participants to pursue interdisciplinary collaboration by indicating the above mentioned directions and by establishing a network of potential collaborators in research projects. The attitude throughout the workshop was open-minded, and during the week, we witnessed an increasing sense of community among the participants.

Furthermore, we increased our awareness of the difficulty to obtain funding for interdisciplinary work. In many cases, research proposals will have to be framed within a larger context, such as the technology

1 https://computationalethnomusicology.wordpress.com/

development for health applications or gaming. On a smaller level, however, we identified possibilities to conduct summer schools and to establish interdisciplinary student projects.

André Holzapfel (Stockholm, Sweden)
Peter van Kranenburg (Amsterdam, the Netherlands)
Julia Kursell (Amsterdam, the Netherlands)
Anja Volk (Utrecht, the Netherlands)

The comparative biology of language learning

3 - 7 April 2017 @Oort

A central and much debated topic in the study of language acquisition concerns the nature of the learning mechanisms that are required. Are these general cognitive mechanisms or language-specific ones? This question also relates to language evolution: why did language only evolve in humans, and what might have been language precursors? If general mechanisms are involved in acquiring language, then it is expected that non-human animals should also be able to learn at least some of the rules that emulate the structure of language. But can they? And what do computational models contribute to understanding the processes involved? These questions formed the background for project of the NIAS-Lorentz Theme Group 2016-2017. The NIAS-Lorentz workshop focused on what studies using the Artificial Grammar Learning paradigm contributed to the topic. It was organized by the participants of the NLTG and marked the beginning of their project. It aimed at :

i. critically reviewing and synthesizing the available evidence in order to identify the insights gained by human (including infant), nonhuman animal and computational studies on the topic, and
ii. identifying the critical questions for future research by developing novel experimental and computational approaches to these issues.

To this end, 40 participants were invited, ranging from developmental and computational linguists, psychologists, neurobiologists and behavioural biologists. It resulted in a truly interdisciplinary and vibrant meeting, with many participants not having met before.

On the first day of the workshop, the main topics were introduced by broad overviews, presenting the state-of-the-art in infant studies, neurolinguistics, animal cognition and computational modelling. This was followed by three thematic days with more focused presentations on recent developments and short 'flash talks' about specific experiments in the mornings, followed by discussion sessions in the afternoons, in which self-organized subgroups met to address a range of related topics. These concerned issues such as methodology, replicability of findings, model comparisons, links between behavioural and neural findings, or differences in theoretical perspectives. On the last day two prominent participants reflected on the outcome of the workshop, followed by a discussion on follow-up activities.

Despite, or maybe because of, their different backgrounds and views, all participants felt that they benefitted from the meeting and discovered connections between their own studies and those of others. It resulted in several new collaborations and grant applications, ideas for follow-up experiments and we also expect it to result in a special issue for a journal. A proposal to this end is under consideration with a prominent interdisciplinary journal at the moment of writing this. Most papers will be written by people who combine their expertise and knowledge for the first time and we expect it will inspire new experimental and theoretical studies.

Carel ten Cate (Leiden, the Netherlands)
Clara Levelt (Leiden, the Netherlands)
Judit Gervain (Paris, France)
Chris Petkov (Newcastle, UK)
Willem H. Zuidema (Amsterdam, the Netherlands)

Solar-Terrestrial and Experimental Plasma Physics Synergy: STEPPS

10 - 13 April 2017 @Snellius

The STEPPS meeting covered a number of important scientific problems related to the multi-scale plasma processes, such as waves and particle acceleration, are thought to exist in a variety of magnetic structures in the atmosphere of the Sun and plasma structures generated in the laboratory plasma. More than 25 participants from Belgium, United Kingdom, Netherlands, Spain, United States, Russia, Ireland and France attended the meeting. Here, we summarize the most interesting outcomes and current progress with grant applications planned during STEPPS and paper publications/ submissions.

A number of a new research links were established. For example, colleagues from the University of Sheffield, UK, University of California at Los Angeles (UCLA), USA, Northumbria University, UK, Trinity College Dublin, Ireland proposed collaborative research (Royal Society, [application submitted], ISF-EPSRC [joint call between UK and Ireland, application in preparation]) which has a potential of providing valuable insights into the important problem of propagation and damping of MHD plasma waves and oscillations in solar coronal loops and prominences. The existing solar observations do not have a good spatio-temporal resolution to identify the actual damping mechanism and test relevant theoretical models. To answer these outstanding questions in solar physics, it is planned to utilize laboratory plasma experiments (UCLA). In particular, it is proposed to:

a. conduct laboratory experiments on kink modes in arched magnetized plasmas;
b. analyse the evolution of the loop cross-section using direct measurement of three-dimensional magnetic-fields;
c. investigate the development of Rayleigh Taylor (RT) type and Kelvin Helmholtz (KH) instabilities and energy dissipation using plasma density and temperature measurements (also relevant to the outstanding problem of the coronal heating);
d. utilize numerical tools to help perform the experiment under conditions relevant to the Sun and better understand the experimental and remote-observational results.

These efforts are expected to help initiate the wide international collaboration among solar and plasma physicists from UK, USA and research groups from other countries involved, and have an immense potential of making a major impact in diverse areas of solar and plasma physics. All of these activities include scientific support from our colleagues in the KULeuven University, Belgium and DIFFER, The Netherlands.

The most memorable "aha" moments came from Prof. Paul Bellan (Caltech, USA) as he described his many laboratory plasma experiments in generating self-collimating plasma jets. These jets are remarkably similar to solar spicules in behaviour and may provide verifiable and repeatable experimental data for solar physicists to compare with their theories and modelling. This was a revelation for the solar physicists present. Also, Paul has proven experimentally that the instabilities in the jets are of RT type and not KH as usually proposed in the solar community. If this is also true for solar spicules, this would be a paradigm shift.

Overall, the organization, support provided by the local organizers and Lorentz Center facilities were of an exceptional standard. The inspirational atmosphere at the Center certainly provided a stimulating environment for all the attendees. We would definitely use this research facility again and have already

advised many of our colleagues to organize meeting hosted at the Lorentz Center, especially for the interdisciplinary research topics.

Hans Goedbloed (Nieuwegein, The Netherlands)
Viktor Fedun (South Yorkshire, UK)
James Lunney (Dublin, Ireland)
Brian Reville (Belfast, Ireland)
Eamon Scullion (Newcastle, UK)
Gary Verth (South Yorkshire, UK)

Privacy by Design Beyond the Screen

24 - 28 April 2017 @Snellius

"Privacy by Design" (PbD) has become a widely supported concept, but is it actually possible to embed legal privacy rules in technology design? And what does it mean to 'embed' 'legal rules' or 'privacy protection' in 'design'? The workshop aimed to:

1. bridge approaches between disciplines,
2. find common ground between legal, technical, and design concepts;
3. conceptually discuss the 'locus' of Privacy by Design (in the hardwiring, in default settings, and/or in the design of the environment);
4. apply Privacy by Design to scenarios of smart toys and augmented reality; and
5. identify implications for law and technology.

These aims have been met. There was intensive, collective interaction between all participants from different disciplines (law, philosophy of technology, industrial and interaction design, computer science, and privacy engineering), leading to joint understandings of the challenges of PbD (aims 1-2), particularly in relation to smart toys and augmented reality, which were discussed at length in sub-groups (aim 4). The discussions made us realise the complexity of PbD in these contexts, but also in general: not only can PbD be located in hardware/software, in default settings as well as in the design of the environment (which was explored in the scenario discussions, aim 3), but it also matters considerably what one understands 'privacy' to mean. The many possible conceptualisations of privacy complicate the understanding of what PbD is or should be. In addition, while it is clear that privacy involves other aspects besides data protection, the relationship between Privacy by Design and Data Protection by Design needs more study, since they tend to be equated too easily. Moreover, it turns out to be difficult, and undesirable, to focus only on the design of particular devices (such as a toy or AR lenses), since these are connected to backend systems where bulk data are processed in continuous processes of machine learning and real-time feedback loops. If one wants to effectively design privacy into smart technologies, this should actually be done from scratch and encompass the entire gamut of infrastructures, platforms, apps, devices, and sensors in a ubiquitously connected world. The main findings and implications for law and technology (aim 5) - widely shared and somewhat of an 'Aha moment' to many - therefore turned out to be a) the importance of a holistic approach to privacy/technology design: many people are working on some pieces of the puzzle, but hardly anyone looks at the whole picture.

Much more should be done, therefore, to connect different communities working on aspects related to privacy/technology design. And b) that the current understanding of Privacy by Design *as a product* is dangerous (since it misleadingly suggests that issues can be 'solved' by accommodating some privacy concerns in an application's design in some form; but privacy can never be achieved by design alone), and should be broadened up and instead be understood as a *process*, which should also acknowledge the broader (political) questions to ensure that proper attention is paid to the real underlying privacy regulatory and design challenges of new technologies.

The proposed outcome was a research agenda for PbD; a policy brief; and a kick-start of joint, multidisciplinary academic papers. The last outcome has been achieved: all three sub-groups have kick-started a joint paper during the workshop, which the participants are now discussing to elaborate in the coming year. The many questions raised have been noted in our elaborate meeting notes and will be used by individual participants to take up in their future research. The policy brief has been put on hold, since the outcome - the problem is even more complex than we envisioned ourselves - is not amenable at this stage to disseminate among policy-makers.

The format of the workshop and the Snellius venue worked very well. The facilities were excellent (except for a screen that, despite many efforts and assistance, no-one was able to connect to a computer); and the walls were used very productively - the venue stimulated to explore different discussion and work formats. There was a good mix of plenary discussions and work in sub-groups.

The agenda, setting, and group of people fostered an atmosphere of intensive collaboration, in which everyone joined and no 'cliques' split off. Participants felt the five-day collaboration was very intense: exhausting and exhilarating at the same time, and several experienced it like an academic holiday. One aspect for possible improvement was that while the workshop was targeted at conceptual discussions, with two scenarios to make the implications concrete, the discussions in the end tended rather to centre more around the concrete cases than around the conceptual questions; although this was not considered a drawback - the discussions were highly relevant in themselves - in a next workshop we might seek to organize the discussions and use of cases somewhat differently. A useful suggestion in the evaluation was also to involve an experienced participant from professional practice to take care of the workshop's process management, since academics are not always the most experienced in managing larger-scale workshops.

Bert-Jaap Koops (Amsterdam, Netherlands)
Tjerk Timan (Tilburg, Netherlands)
Jaap-Henk Hoepman (Nijmegen, Netherlands)

A Disorder of Emotion Regulation: Alexithymia

1 - 4 May 2017 @Oort

People with high levels of alexithymia display notable difficulties in identifying and describing their emotional feelings. The scientific study of alexithymia is nowadays a booming enterprise across multiple disciplines, including psychology, neuroscience, psychiatry, and psychosomatic medicine. The aim of this NIAS-Lorentz Workshop was to bridge the interdisciplinary research in alexithymia. This was the first time in four decades since the construct was first suggested that researchers across the entire field gathered together in a single meeting. For this meeting, the participants came from 13 different countries: Belgium, Canada, Cyprus, Finland, France, Germany, Italy, Japan, Netherlands, Poland, United Arab Emirates, United Kingdom, and United State of America.

The workshop brought together 15 state-of-art presentations from different fields studying alexithymia. A direct and tangible outcome of these presentations will be the publication of a handbook on the recent developments in alexithymia research. The presentations from the workshop will be written as chapters in the upcoming months, and will be published as a book by Cambridge University Press. The projected publishing date is 2018.

Alongside presentations, the workshop also included group discussion sessions at the end of each day. In these discussion sessions, the participants divided into smaller groups to tackle specific issues concerning alexithymia research, which was one of the aims for the workshop. These sessions brought together researchers from different fields, which created a highly innovative atmosphere. At the end of the workshop, we provided these groups with online communication channels to continue their work and collaborate for future projects.

The format of the workshop worked great for our workshop. Each day included 4 to 5 talks, and every talk was followed by a 25 mins discussion session. All participants were highly active, and they were asking intriguing questions. We also recorded these discussions and sent it to the speakers to use it as a feedback in their future work, which was highly appreciated.

The group discussion sessions at the end of each day, mentioned above, was new for everyone. On the first day, we asked participants for general topics that they would like to discuss. They could write them down on the 'magic papers' that we hanged in the large room. After lunch, we asked them to rate the topics that was mentioned for their interest. From these ratings, we picked the top three topics as the subject matter of group discussion sessions. Even though it was a bit chaotic on the first day, the participants got used to it the following days, and we received positive feedback.

Overall, participants were highly impressed by the facilities of Lorentz Center. Organizers also found it tremendously helpful to have Lorentz Center's support. Overall, everyone enjoyed the week full of talks and discussions, as well as the social program (Wine and Cheese, and the Dinner at the beach).

Michiko Kano (Sendai, Japan)
Sander Koole (Amsterdam, the Netherlands)
Olivier Luminet (Leuven, Belgium)
Dalya Samur (Amsterdam, the Netherlands)

Participants of NIAS-Lorentz Workshop 'A Disorder of Emotion Regulation: Alexithymia'. May/2017

Cross Scale Resilience in Socio-Ecological Simulations

1 - 4 May 2017 @Snellius

Workshop Topic

Mankind is having a huge impact upon the species with which it cohabits, maybe causing a sixth major extinction of species at this very moment. To address this, we need to understand how societies interacting with their local ecologies are either fragile or resilient to the impact of humans and other shocks. Simulations can represent combinations of complex ecological and social systems. These allow us to generate artificial 'histories' from which we can gain a deeper understanding of long-term outcomes, including the resilience of the socio-ecological systems (SES) at any scale: from global species diversity to the welfare of group or even of individuals.

Workshop Objectives

- To gather together a small number of highly motivated researchers on the above topic
- To identify the principal challenges of the project as well as possible ways forward
- To identify synergies and complementary skills among participants developing work that integrates different skills, tools and approaches
- To foster longer-term collaborations that will ensure this project is significantly progressed
- Which might include joint: publications, grant applications and further meetings.
- To start developing a coherent and practical approach to characterising cross-scale resilience within complex social-ecological systems.

Tangible Outcomes

A number of specific projects were developed, and plans agreed upon, including:

- The specification and development of one or two didactic agent-based models suitable for demonstrating the issues of cross-scale resilience within a socio-ecological simulation.
- A mapping and specification of the factors important at different scales up to a global "SES model", with an agreement to work on a joint position paper on this.
- A fresh analysis of the concept of resilience, with a plan to examine the dynamics of three simulation models and three case studies using this framework and then write a paper on this.
- A set of plans to "make a difference" and promote awareness of the possible threats to the resilience to our socio-ecological systems, including a position paper suggesting an equivalent to the IPCC for SES, and the invention of board/online games.

Scientific Breakthroughs

We decided that resilience was not a measurable "variable" but rather an umbrella concept for a set of theories for why target properties of observed systems persisted.

Workshop format

The workshop included a fair number of matching and academic getting-to-know-each-other exercises (including introductions, a general poster session, an academic "speed dating" session and a session matching needs and offers). This was in addition to 10 presentations on relevant topics and breakout sessions to develop specific areas of collaboration that emerged. This flexible format enabled a lot of intensive work to be achieved by the end of the workshop.

Other

Whilst the general format and support given by the Lorentz Center was excellent, we did not feel that the comments by the reviewing committee were very helpful, which seemed more to defend particular interests. In particular, of all the NL people they insisted on us inviting, only one bothered to reply and that one in the negative. As it was, we already had a good proportion of academics (including Ph. D. students) from the NL at the workshop.

Géraldine Abrami (Antony, France)
Bruce Edmonds (Manchester, United Kingdom)
Eline de Jong (Wageningen, the Netherlands)
Christophe le Page (Brasilia, Brazil)
Gary Polhill (Dundee, United Kingdom)
Nanda Wijermans (Stockholm, Sweden)

Python in Astronomy

8 - 12 May 2017 @Oort

Python in Astronomy was held to build on the foundation of existing community-developed astronomy software to ensure that the future needs of the community will be met. The aims of the workshop were to:

- Build upon current collaborations between Astropy, SunPy, DKIST and LSST to ensure the software developed by each forms a coherent ecosystem.
- Train a dozen new active developers.
- Develop new tutorials and a plan for developing more tutorials for existing community code.

There were several concrete outcomes from the workshop. Roughly 20 repositories were created on GitHub at the conference, and several attendees (an additional 10 beyond those who created new repositories) opened their first pull request or packaged their software for use by others. Sprint days to write new tutorials for existing were planned at the conference and will be held late September, along with a plan for developing more extensive documentation. An online proceeding of the talks and informal "unconference" sessions is being written. That, and videos of many of the talks, will be posted on the conference web site.

One "aha" moment came during extensive conversations over several days between Astropy and the Large Synoptic Survey Telescope; we developed a plan for integrating the data types used to represent images which will ensure that users can seamlessly use software tools from either set of software.

Four days of the workshop were a combination of talks in the morning followed by "unconference" sessions in the afternoon. The topics for the unconference were proposed and chosen by participants each day. This fostered productive discussions each afternoon; the only real difficulty participants reported was choosing between the parallel unconference sessions. One of the days was reserved for sprinting on code, tutorials, documentation, and packaging, with reports from participants at the end. The space at the Lorentz Center is extraordinarily well-suited to this kind of meeting because of the large number of small meeting spaces available. We would definitely advise others to use this kind of format.

The Lorentz Center made it remarkably easy to organize and run the conference. Our only suggestion is to upgrade the internet connection in the main meeting room. We had hoped to live stream the talks and were unable to, in part because of bandwidth limitations. A related suggestion is to have a video camera to the room for recording talks for either streaming or later uploading.

Matt Craig (Moorhead,MN, United States)
Kelle Cruz (New York City, NY, United States)
Daniela Huppenkothen (New York City, NY, United States)
Stuart Mumford (Sheffield, United Kingdom)
Abigail Stevens (Amsterdam, the Netherlands)
Erik Tollerud (Baltimore, MD, United States)

Perspectives on Developmental Robotics

15 - 19 May 2017 @Oort

The rapidly growing field of Developmental Robotics has two objectives:

- to use robotic models to inform cognitive developmental theory, and
- to use cognitive developmental theories to help create better robots.

This interdisciplinary workshop brought together roboticists, developmental psychologists, cognitive (neuro)scientists, computer scientists and philosophers, with the aim to identify future research directions and foster new interdisciplinary perspectives on developmental robotics and developmental science in three themes:

- Embodiment: How do infants, and could robots, learn about their body and its efficacy and use it to learn other cognitive skills?
- Social interaction: Which aspects of human development depend on interaction with other social agents at a particular time to develop in a typical fashion?
- Cognitive Architecture: Which part of the cognitive capacities and knowledge is predefined in the cognitive architecture and how can architectures as a whole learn?

#DevRobLorentz at Twitter: 115 tweets online and counting

The workshop had numerous communicative outcomes as result of the interdisciplinary discussions. A consensus was for example achieved about different notions and purposes of "models" in our fields, such as normative, descriptive, or explanatory models. Another discussion that was universally regarded useful was about innate biases, in which roboticists and psychologists mutually informed each other about theoretical and empirical perspectives on such biases from their respective fields. Another relevant discussion revolved around the nature of feedback in social interaction.

One of the immediate outcomes of the workshop was high visibility on social media that brought the topic as well as the Lorentz center to many peoples attention. In order to continue the scientific discussion the organizers are now pursuing a written dialogue format in the bi-annual newsletter of the IEEE committee on Cognitive and Developmental Systems. Further, we aim at communicating key findings and future directions in a white paper. Behind the scenes, the workshop already lead to one new cooperation of a co-organizer and a participant on a research grant proposal focusing on the above mentioned social feedback dynamics.
We received very positive feedback from the participants on both the site and our format comprising keynotes, topic-specific discussions, as well as entirely open discussions. We wrapped up the workshop by having topic-specific groups work out specific, reachable research goals for the next three years. Numerous such goals, ranging from concrete experimental question to theoretic questions and specific articles, have been identified, and on which we can hopefully report again in a few years of time.

Johan Kwisthout (Nijmegen, The Netherlands)
Matthias Rolf (Oxford, UK)
Matthew Schlesinger (Carbondale, IL, USA)
Lorijn Zaadnoordijk (Nijmegen, The Netherlands)

Multilateral Governance of Technological Risk

22 - 24 May 2017 @Oort

Various existing and emerging technologies create risks that are not confined by national borders. While they add to the institutional complexity of the global system, they also contribute to the emergence of new forms and practices of governance. New forms of risk governance have been developed that go beyond the nation-state. The need for multilateral governance of risk does not only arise when consequences of technological risks are cross-boundary (such as in a nuclear accident) but also when the risk itself is created internationally; think of civil aviation or the use of GMO in agriculture. Yet in other situations, multilateral collaborations are indispensable for managing or reducing certain risks (such as in water pollutions). In conceptualizing multilateral risk governance, we aimed to shed light on the differences between different types of transboundary risks, their associated uncertainties and the required regulatory responses at the international and national level.

Addressing such complex international and multi-level governance of technological risk requires the engagement of different disciplines in articulating and tackling the underlying ontological, epistemological, methodological and ethical dimensions. This project brought together scholars from sociology, philosophy and ethics, Science and Technology Studies, anthropology, history, law, political science as well as the engineering sciences. We have inquired and compared the key challenges for multilateral governance that stem from existing, expanding and emerging large-scale technological systems. With an interdisciplinary group of scholars we have focused on the following questions:

- What are the key questions and challenges of multilateral risk governance in your own field of research, and when you consider other (adjacent) fields? (synergy)
- Where should we be headed in the next ten years? (academic prospects)
- What can the world of policy-making learn from the academic insights, when it comes to new challenges of multilateral risk governance? (societal prospects)

We have concluded that one important challenge is to determine what the field actually includes. Since different scholars from different disciplines see the field and its key challenge differently. Having a better understanding of this is crucial for further steps.

The tangible outcome of the workshop is the publication of two special issues with *Journal of Risk Research and with Risk, Hazard & Crisis in Public Policy*. The editor-in-chiefs of both journals participated in the workshop and agreed to accommodate these special issues as guest edited by the organizers of the Lorentz Workshop. The latter special issue with RHCPP will also be turned into a book at a later stage, to be published with Westphalia Press. These publications would indeed delve into the main questions of multilateral governance form the perspective of different fields, but it became also clear that the publications will mark the beginning of a long-term endeavor to spell out the key challenges of multilateral governance for different fields but also for different types of technologies. Another tangible outcome of the workshop was the forming a critical mass to move ahead with new plans and projects for continuing this endeavor.

The organizers and workshop participants were quite happy with the format of the workshop and with the facilities that the Lorentz Center provided us with. Indeed, we will acknowledge the Lorentz Center in the forthcoming publications and we will keep you posted when the publications will be finalized.

Marjolein van Asselt (Maastricht, the Netherlands)
Ibo van de Poel (Delft, the Netherlands)
Behnam Taebi (Delft, the Netherlands)

Order structures, Jordan algebras, and geometry

29 May - 2 June @Snellius

The concept of a Jordan algebra has a long and rich history in mathematics. It was originally introduced by Pascual Jordan as a way of finding alternative algebraic models for quantum mechanics, but it turned out to have numerous connections with distinct areas of mathematics including, Lie theory, geometry, and mathematical analysis. The finite dimensional Euclidean Jordan algebras were characterized by Koecher and Vinberg in terms of symmetric cones. For infinite dimensional real Jordan algebras no such characterization is known. The main objective of the workshop was to bring together people from different areas in mathematics to explore possibilities of obtaining alternative characterizations of real Jordan algebras, which would include infinite dimensional ones, in terms of the geometry of cones and their associated order structure.

The workshop attracted 25 participants at all levels of seniority with diverse research expertise including, geometry of Banach-Finsler manifolds, infinite dimensional Lie theory, partially ordered vector spaces, operator algebras, Jordan algebras, and metric geometry. The format of the workshop worked well with four hours of lectures each day: a two-hour introductory talk introducing the main theme of the day and two one-hour talks that were more specialized. There was plenty of time for discussion and small group collaborations. We also had two stand-up sessions for which people could sign up to present further thoughts, or lead a discussion, on the problems and results. These sessions worked well and quickly became very lively with a lot of audience participation.

We got a lot of positive feedback from participants who really found the event enriching and enjoyable. Although there were no major breakthroughs or "aha" moments, it has become clear that there are various promising lines of investigation to extending the Koecher-Vinberg theorem to infinite dimensions that deserve to be explored further. A first approach takes a geometric point of view and replaces the Riemannian structure that exists in finite dimensions by a Finsler structure coming from the so called Thompson metric. It aims to characterize the JB-algebras among the complete order unit spaces as the ones whose cone is a symmetric Banach-Finsler manifold. Here work by Neeb on Banach-Finsler manifolds with sprays is potentially useful. A second one takes an algebraic approach following work by O. Loos on symmetric spaces, and further studies by Bertram, and Lawson and Lim. A third approach is to connect the real setting to the complex one, which is better understood, and use work by Braun, Kaup and Upmeier. A fourth approach, which was suggested by works of Walsh and Lemmens, van Imhoff and Roelands, takes an order theoretical point of view and relies on the existence of orderantimorphisms. This approach appears to be the most ambitious one, as it assumes the least structure.

All presentations have been made available on the conference website and a list of open problems and ideas resulting from the workshop will be prepared and added later. The workshop has already stimulated work in this area, see the recent paper by W. Bertram (arxiv.org/abs/1706.09155). It will undoubtedly have further impact. Overall we were really pleased with the event. The organizational support from the Lorentz Center staff was outstanding, and made it very easy for the organizers to focus on the scientific part of the workshop.

Cho-Ho Chu (London, United Kingdom)
Bas Lemmens (Canterbury, United Kingdom)
Onno van Gaans (Leiden, Netherlands)

International Software Architecture PhD School (iSAPS)

5 - 9 June 2017 @Oort

Science

Our goal was to establish a doctoral school for the field of software architecture that would provide young researchers and practicing architects from industry the opportunity to learn from the leaders in the field. Thus we planned to educate the participants in the most recent concepts, methods, language and tools, that are produced by the top research groups and industrial environments, in a highly interactive setting and with practical work on real industrial case studies. According to the feedback we received, we can claim success regarding this goal.

The 37 students worked in groups on the industrial cases studies under the supervision of a senior researcher and in collaboration with a software/system architect from industry. The outcome of each group work was a solution to the architecting problems formulated in the respective case studies by the case owners. Those solutions are the main output of the school. Secondary outputs are the knowledge and skills that the PhD students and architects acquired during the lectures, the established bridge between academia and industry, and the open research problems that were formulated and can be considered as future work for the PhD students.

Many PhD students were not aware of the complexity of either software architecture in practice, or the role of the architect. The importance of social and cognitive aspects intrinsic to software architecture design and design-decision making were also a surprise, along with the combination with empirical research: architecture as a theory to guide architecture design.
Finally, many students mentioned that the gap industry-academia was bigger than they had expected, and noted the unusually-high number of women PhD students attending.

Organization/Format:

The whole idea of a PhD school was relatively new for Lorentz and according to the participants, it was a very successful experiment. The part of the format that worked exceptionally well was the combination of lectures in the morning and case study work in the afternoon. Another point we want to keep in the future is the involvement of practicing software architects from industry, as this gave the opportunity to PhD students to get in contact with real-world problems (for some of them, this was their first time) and reflect on the relevance of their (academic) research to the practice in industry. Furthermore, at the end of each day we had a short reflective plenary session where each group presented the outcome of their work.

Finally, we had a retrospective at the end of the school where we asked the participants to express: a) positive feedback, b) points for improvement, c) "a-ha!" moments they had during the school and d) items that remained a mystery. We would recommend this retrospective format to other organizers.

During the retrospective session at the end of the school, a number of participants mentioned that they would have liked projectors in the different offices where we had break-out groups. Also some participants mentioned that they were lodging in hotels across town since there was no availability in the nearby hotels. This was sub-optimal for community building.

Paris Avgeriou (Groningen, the Netherlands)
Philippe Kruchten (Vancouver, Canada)
Patricia Lago (Amsterdam, the Netherlands)

Re-enactment, Replication, Reconstruction

Performative Methodologies in History of Science, Archaeology, Conservation, Musicology and Anthropology

12 - 16 June 2017 @Oort

This workshop's goals were to reflect on reconstruction, re-enactment and replication (RRR) practices across the fields of history of science, archaeology, conservation, musicology and anthropology research, and to learn from each other. Until now, disciplinary connections have been a rare exception, approaches to RRR having been developed within the disciplines themselves. In the RRR workshop, they were made accessible to the other disciplines, and experiences were exchanged. Partly funded through the ERC Artechne project, the workshop brought together specialists and junior researchers (PhD/Postdoc level) from these fields. Three additional places for junior participants were advertised and candidates selected based on their CV an motivation. Three interdisciplinary themes helped link the disciplines: typologies of RRR, use of sources for RRR, and archiving and reporting.

The workshop had a varied program, consisting of a keynote lecture from each discipline, demonstrations and excursions to sites of RRR practices, such as the Museum Boerhaave and the Amsterdam Ateliergebouw. Workshop participants made and experienced RRR together in reconstructions, replica making and re-enactment activities. A well-attended public lecture, held at the Hortus Botanicus and introduced by the director of Museum Boerhaave, focused on virtual reconstructions and 3D technology.

During the first days of the workshop, emphasis was placed on informative sessions, as we needed to acquaint ourselves with RRR practices across the different disciplines. Participants expressed their amazement and enthusiasm about the ease with which researchers from other disciplines understood their methods and the issues they faced; even though each of the disciplines has developed its own methods and may ask different questions, experience with performative methods proved to be a strong binding factor across the disciplines.

During the week, the focus of the program gradually shifted from 'providing information' to 'hands-on experience', as interactive activities took up a larger part of the program. Such activities were received with enthusiasm and led to discussions about documentation styles and methods, disciplinary characteristics and practices. The last day of the workshop included a session on communicating RRR to a wide audience using film, exhibitions, re-enactment in open air museums, etc.

The RRR workshop proved to be an important step towards an improved and broadened context for the application of performative methods in different disciplines. An immediate and important result is the establishment of an informal interdisciplinary network of researchers employing RRR. This network is open to all RRR workshop participants; other researchers are welcome to join. After an initial phase, we consider applying for a network-funding to boost activities. A website will be set up connected to but independent of the website of the Artechne project for communication, exchange and visibility. We have also started a mailing list and a newsletter via email, that network members can use for announcements that fit with our purpose of connecting researchers who use performative methods when they organize interdisciplinary activities/publish material of a similar scope, etc. Finally, initial steps have been taken towards the publication of a selection of papers from the workshop.
All in all, we consider the RRR workshop a great success and intend to organize more joint activities in the future, possibly applying for another Lorentz NIAS workshop. Based on our experience organizing the RRR workshop, for our next workshops we will reserve even more time for practical activities.

Sven Dupré (Utrecht, the Netherlands)
Anna Harris (Maastricht, the Netherlands)
Julia Kursell (Amsterdam, the Netherlands)
Patricia Lulof (Amsterdam, the Netherlands)
Maartje Stols-Witlox (Amsterdam, the Netherlands)

The mental lexicon

Using ontologies as a means to gain insight into the structure of the lexicon in time, space and cognition

12 - 16 June 2017 @Snellius

The aim of this workshop was to bring together (historical) linguists, psycholinguists, dialectologists, language technologists, literary scholars, philosophers and historians in order to discuss how we can advance our understanding of the structure of the lexicon in time, space and cognition by linking different data sets to each other.

The starting point of the discussion was that the vocabulary has both a psychological and a socio-historical dimension, since the vocabulary is on the one hand passed on through first-language acquisition and is develops in the head of the language user, and on the other hand is the result of historical developments in which, a.o., external factors are involved such as second language acquisition. This provides a number of interesting questions, such as: What is the interaction between the psychological and socio-historical dimension? Which lexical elements are stable in different languages and dialects, or over time, and which are subject to change? What factors determine that? To what extent do semantic formats in (learned) traditional dictionaries reflect a psychological reality?

During the workshop we looked at these questions from different angles, and we learned a lot from disciplines we were not yet acquainted with. The interdisciplinary approach was new for all of us and proved a success. Since we did not know researchers, research methods and research results from the other disciplines, we choose to program each day around a particular discipline and mix lectures with discussions, in order to get to know as much as possible from each other's approaches.

We learned how research on the structure of the lexicon is currently being conducted within different disciplines and with methods that are for some part shared, such as ratings, reaction times, word associations, corpus research, semantic vectors, distributional models. We also gained insight into the datasets that were collected within the different fields, such as data on word associations, word recognition and lexical decision-making, made available by psycholinguists through large-scale surveys, or terminology lists, the lexical semantic database Wordnet and LIWC (Linguistic inquiry and Word Count), drawn up by linguists and computer psychologists. Finally, we saw how corpus research provides new data on frequency and semantic relationships.

One of the conclusions of the workshop was that linking the various enriched data sets is a prerequisite for deeper insights into the mental lexicon. We have deliberated on the blueprint of how words (and meanings) from different data sets can be linked to various, hierarchically ordered ontologies, using concept alignment tools. In order to proceed further we have decided to form an interdisciplinary Dutch-Flemish consortium. The purpose of the consortium 'The mental lexicon' is to share information, data, methods and research questions. To begin with, we will build an infrastructure in which the different data sets can be linked and searched, based on a suitable ontology. One of the participant institutes is prepared to host such an infrastructure.

In addition, we plan a joint grant application to answer new research questions. In order to realize this, we will apply in the summer of 2017 for an NWO KIEM grant to enable a postdoc to develop the ideas of the Lorentz workshop. Together with the creative industry we will also think about more practical applications of the linked data sets and the combined knowledge, for example in text mining, language

tests, second language acquisition or the composition of innovative (digital) dictionaries based on the way in which concepts are linked together in the human brain.

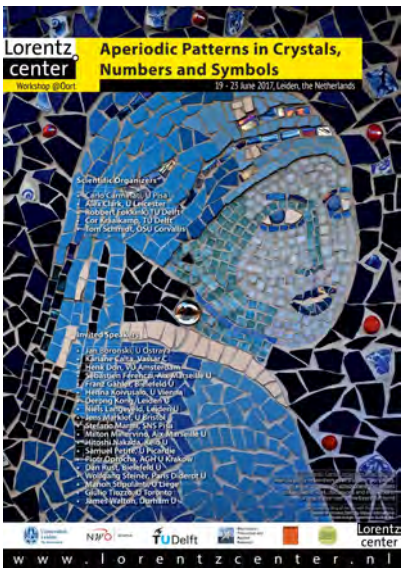
The consortium is open for new members. A short account of the Lorentz workshop that we published on Neerlandistiek.nl (http://www.neerlandistiek.nl/2017/06/inzicht-in-het-mentale-lexicon/) resulted in 9 new members, two of which from South Africa.

Learning about others' work in a wide range of disciplines produced a host of "aha" moments, and all members of the workshop have expressed that they have learned a lot from the other participants and are very motivated to start up interdisciplinary collaboration, since this will be the obvious way to move our knowledge forwards. The participants were also very satisfied with the format of the workshop and with the organization by the Lorentz Center.

Marc Brysbaert (Ghent, Belgium)
Dirk Geeraerts (Leuven, Belgium)
Isa Maks (Amsterdam, Netherlands)
Nicoline van der Sijs (Nijmegen/Amsterdam, Netherlands)

Aperiodic Patterns in Crystals, Numbers and Symbols

19 - 23 June 2017 @Oort



Description and Aim

Quasicrystals show nearly periodic patterns, which can be seen as the projections of regular crystals in higher dimensional spaces. These regular crystals in higher dimensions are rings of integers in a number field, and that is why there is a connection between crystallography and number theory. There are other connections. Numbers can be represented as strings of digits, while crystals are made out of elementary shapes. The patterns of these building blocks can be studied by symbolic dynamics. Crystallography, number theory, and symbolic dynamics are separate fields. The aim of the workshop was to bring together researchers from these separate fields.

Outcomes of the workshop

Several open questions were raised at the workshop and one of these was even solved during the week. Wieb Bosma (Nijmegen), Michel Dekking (Delft) and Wolfgang Steiner (Paris) settled the Biberstine conjecture, which says that three different integer sequences are in fact one and the same. These three sequences arise from a certain continued fraction expansion, a rotational dynamical system, and a Fibonacci recurrence. Bosma, Dekking, and Steiner proved that the conjecture is correct. Each one of them took care of a different sequence, using computer algebra, substitution dynamics, and hard analysis. This interaction was representative of the interactive atmosphere of this workshop. Many researchers that had not cooperated before joined hands and achieved considerable progress on different problems. We intend to publish their results in a special issue of Indagationes Mathematicae in 2018.

Organization and format of the workshop

This workshop belongs in a series of Lorentz workshops on Numeration (2010) and Streams (2012, 2013) and workshops in Delft on Probability and Numbers (2012, 2015). These earlier workshops had an emphasis on the interaction between mathematics and computer science. The present workshop was more focused on the interaction between modern continued fraction theory (such as translation surfaces) and quasicrystals (cut-and-project schemes).
The talks in the workshop were a mix of long and short lectures. There were survey lectures as well as short talks by PhD students and postdocs. We scheduled some open afternoons, to allow participants to enter talks until the last moment, so that fresh results could be reported in short talks. This worked very well and led to many discussions that were carried on in front of a blackboard.

Acknowledgements

This workshop was made possible by the generous support of the clusters Diamant and Star, TU Delft, Foundation Compositio, and the Lorentz Center. We would like to thank Nienke Tander of the Lorentz Center for taking excellent care.

Carlo Carminati (Pisa, Italy)
Alex Clark (Leicester, UK)
Robbert Fokkink (Delft, the Netherlands)
Cor Kraaikamp (Delft, the Netherlands)
Tom Schmidt (Corvallis, OR, USA)

Visualizing Digital Humanities

19 - 23 June 2017 @Snellius

The workshop had four general goals :

- inform librarians and humanities scholars about advanced visualization techniques allowing them to manage, present, and analyze large quantities of (bibliographic) data;
- identify and describe problems faced by librarians and humanities scholars that can be overcome by using advanced visualization and visual analytics techniques;
- test and evaluate visualization techniques to determine whether they meet the needs of librarians and researchers in the humanities;
- formulate new research questions and a research agenda that will guide future collaborative work of the participants.

The expected outcome was to build and evaluate promising visualization prototypes of datasets supplied by librarians and humanities scholars that will be further developed and used by the participants of the workshop.

Among the most interesting developments that could, already, be termed a (beginning) scientific breakthrough were four aspects.

- The realisation that (representatives of) three of the communities involved (visualization, natural language processing and philosophy) shared the importance and the urgency of 'unboxing the black box' in their respective fields, and started formulating ideas for joint pilot projects;
- these three communities also realised that they will need each other to work at a high level of methodological refinement to be able to make significant headway in providing sensible visualisations for text-based humanities.
- On the library data providers' side, the realisation that the full-text digital material currently freely provided by libraries and cultural heritage initiatives on the internet is extremely limited, and that researchers in the humanities who want to take the computation step in their fields face extreme difficulties with building suitable corpora and need support for their workflow;
- the realisation that current library metadata interfaces (e.g. of WorldCat) present information in a way that is far from ideal as far as the aims of the research community in text-based humanities is concerned; visualization can be of invaluable help in increasing knowledge flow and facilitate the work of researchers.

Recommendations and visualization prototypes were formulated during the workshop and connected to all goals above.

Participants found the format - focused mainly on hands-on group sessions rather than traditional presentations - fruitful and inspiring. The format was new for most of the participants involved. Follow-up workshops are being planned at the moment that try to stay close to this particular format. We would strongly advise this format to other workshop organizers. The participants found the physical setup of the Lorentz Center - plenty of breakout rooms with entire walls to write on - ideal.

Arianna Betti (Amsterdam, the Netherlands)
Bettina Speckmann (Eindhoven, the Netherlands)
Titia van der Werf (Leiden, the Netherlands)

Fundamental Electrocatalysis

Theory Meets Experiments

26 - 30 June 2017 @Oort

Charge transfer reactions in electrochemical environment underpin the operation of emerging energy and information technologies. Understanding these processes at the atomistic level is a key for their optimal design.
In our workshop we have considered the main open challenges in electrocatalysis, namely:

- Disclosing the functional relationship between double layer, potential drop at electrified interfaces and the effect of an applied potential to a cell.
- Developing new comprehensive models for electrocatalysis at novel, efficient and non-precious catalysts.
- Gaining insight into the origin and control of forces, charge transfer, atomic dynamics and reactivity at the nanoscale.

We reviewed the multifaceted phenomenon of electrocatalysis at the nanoscale from theoretical, computational and experimental perspectives, from fundamentals of electron transfer to commercial applications. We focused on developing a truly multidisciplinary perspective, which is critical to successfully close the gap between theory, experimental insight and technological applications.

The **outstanding level of our speakers and the oral presentations**, the common willingness to push forward the traditional communities' boundaries expressed in our participants' invaluable comments and suggestions during the discussions turned this workshop into a **remarkably vibrant scientific event**.

The modern challenges of electrocatalysis were discussed from different perspectives and are briefly summarised in the following paragraphs.

The most important strategies and quantities to be modelled in modern electrochemistry were analysed in depth. The need for going beyond the standard hydrogen electrode computational scheme emerged in many occasions, developing more refined models for solvation (Gross, Dabo, Reuter), overcoming the assumption of proton-coupled electron charge transfer and performing kinetics studies. How to model the effect of the applied potential and charge polarization at interfaces was discussed in depth (Schmickler, Gross, Sprik, Chen), as well as the issue of energy-level alignments (Reuter, Thygesen) and the relevance of surface science studies on semiconductors to understand electrochemical processes (Todorova). The effectivity of adopting in-depth approaches aiming at representing realistically the electrochemical environment was compared to computational screening approaches to span a broad range of materials using traditional descriptors (Skulason), possibly aided by robust screening methods (Gavartin). Theoretical and experimental studies on cheaper and more efficient catalysts for molecular (O, CO2, N2 and more) oxidation and reduction reactions were proposed, connecting model surfaces to nanostructured systems (Chan, Skulason, Bandarenka).

All the different communities agreed about the need for a better resolved experimental observation of fundamental electrocatalytic processes in electrochemical environments. The great potential of nano- spectroscopies and microscopies (and, in general, of combined experimental investigation) was clearly highlighted, in view of the understanding of structures and energy conversion processes at interfaces (Domke, Roke, Backus, Tromp, Kunze-Liebhäuser). Remarkable examples were presented controlling charge and structure of electrified interfaces and transformations therein (Rupp, Schmidt, van Ruitenbeek) and its effect on the electrocatalytic activity.

Intense debates in the specific discussion groups led to a new perspective on electrocatalysis. For example, important similarities and differences between charge transport phenomena in molecular electronics and electrocatalysis were discussed, found in the common experimental setup - which includes an electron source, a gate, an electron drain and a solvent. To the best of our knowledge, such non-conventional perspective on the electrocatalytic phenomena had not been discussed before (Seideman, Di Ventra, Thygesen, Chiechi, Rudolf).

The ideas and concepts generated during our workshop are evolving into a **review paper**, to be submitted to Chemical Society Reviews of the Royal Society, and further to the formation of a new larger interdisciplinary community, through a H2020 **COST action**.

Our workshop lasted 5 days. We had 60 participants, 25 of whom were invited speakers. Our workshop was **distinct from a regular conference both in terms of structure and purpose**.

- We asked all the speakers to introduce the whole audience to their own field of study and to highlight the challenges they are facing.
- There were no questions and answers at the end of each talk - the discussion of each two or three talks was grouped into a single discussion session, to keep the discussion multidisciplinary.
- A scientific questionnaire was distributed well in advance of the conference where participants were asked to provide their personal input, views and ideas, reflecting on the three main challenges proposed by this workshop and to reflect on the links between the different communities present. A copy of the questionnaire is attached below.
- The central part of this workshop was devoted to thematic group discussions, where each participant could speak out and discuss the issues raised in the questionnaires. At the end of each group a written report - attached below - was delivered to the organizers. We had two group sessions and five groups per session. Every group had a coordinator and two co-coordinators. Participants were asked to enroll into a group of their choice. The identity of coordinator and co-coordinators was decided by the organizers for the first session in order to enforce a multidisciplinary discussion within each group. An expert of the theme of the group and two scientists with complementary expertise were included in each group. The group coordinators of the first session were: Group 1: Sprik /Van Ruitenbeek / Santos; Group 2: Gross / Rupp / Thygesen; Group 3: Shmickler / Backus /Kunze-Liebhäuser; Group 4: Honkala / Schmidt / Chan; Group 5: Di Ventra/Filhol/ Todorova. In the second session every group elected their coordinators.
- To further favor the discussion among participants, we limited the frontal lectures to a maximum of three hours per day and included several coffee breaks.

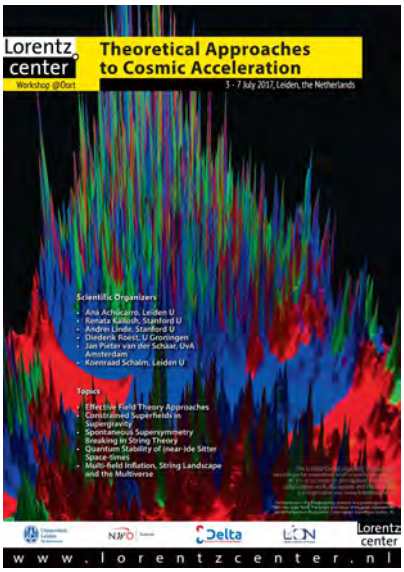
The late afternoon and evening of day 3 was dedicated to the conference dinner and boat trip. We think that the special format adopted was particularly fecund. Especially the idea of having an arched discussion session each two/three oral presentations nailed our purposes, promoting multidisciplinary and general discussions, yet, on the specific session topic. The small group discussions stimulated an open and dynamic exchange of ideas. Overall, the workshop was very intense in terms of time and topics discussed therein, yet its **thoroughly planned schedule and structure** allowed swift communication among the different communities. The success of the workshop was also due to the exceptionally high quality of the invited speakers, the day chairs and discussion leaders, who always had the ability to find bridges between the different ideas discussed. Two plenary discussions were organized at the beginning and at the fourth day of the workshop. Young scientists were specifically invited to present their perspective. All off them and also many senior participants explicitly claimed that the workshop provided a very educational and stimulating experience. A flash poster presentation and poster prize (€200 to the winner and €100 for second and third places) was set up to favour active participation of young scientists. The first prize was assigned to Bohdan Yeroshenko Debye Institute, Utrecht University (NL); second and third prizes to Nicholas Hoermann, THEOS, EPFL (CH) and Lisa Dreier, MPI Mainz (DE). Finally, we are proud that about 50% of the speakers and the large majority of chairpersons were both young and senior women. This is quite exceptional for any STEM event. A special session on gender bias in science was organized during the evening of day 4. The discussion was very animated and stimulating and brought out some of the hidden biases against women still present in the STEM society. We are grateful to Lorentz Center for hosting our workshop with generous financial and organizational support. We thank Psi-k Network and Schroedinger company for generously sponsoring our workshop.

Konstantinos Antonopoulos (Munich,Germany)
Federico Calle-Vallejo (Leiden, the Netherlands)
Clotilde Cucinotta (Dublin, Ireland)
Marc Koper (Leiden, the Netherlands)
Monica Kosa (Haifa, Israel)

Theoretical approaches to cosmic acceleration

Connecting string, supergravity and quantum field theory aspects of (near-) de Sitter space

3 - 7 July 2017 @Oort



Cosmological observations provide strong evidence for the presence of positive vacuum energy density in our universe. This is so at early times (cosmic inflation) and at late times (dark energy). The vacuum energy is the reason why the expansion accelerates. While many simple models can account for the phenomenology of accelerated expansion, embedding such models into a fundamental, consistent theoretical framework poses one of the main challenges in theoretical physics today. This Lorentz Center workshop was a focused attempt to make progress in this very difficult problem.

The workshop brought together a small group of experts, both from a top-down (string theory and supergravity) as well as a bottom-up quantum field theory / effective field theory (EFT) perspective. There had been recent, independent theoretical developments in both approaches, and our challenge was to communicate these efficiently across subdisciplines.

We experimented with a format that would maximize discussion and it turned out to be exactly what was required. Each day focused on a different subtopic. It started with a 1.5-hour detailed review by one of our (younger) experts, including approximately 30 min for questions and discussion. After that, there were a few research talks and each day ended with a long discussion session led by a senior scientist. Some weeks before the start of the workshop, the leaders of the discussion sessions had been asked to coordinate with their corresponding morning reviewers to try to identify ahead of time some of the important open questions where progress could be made. These topics were put on the agenda for each day's discussion session, and the remaining time was dedicated to any other issues that had come up during the day.

The result was excellent. The workshop drew a much larger number of participants than the forty we had initially planned for, and the atmosphere in the Gratama room was both relaxed and exciting. There were so many questions and comments that we kept going overtime, but the program was flexible enough to accommodate these changes. Discussions and collaboration continued during coffee and lunch breaks, also involving students and early-stage researchers. Most importantly, new ideas and collaborations have emerged as a result (some research papers explicitly acknowledge the hospitality of the Lorentz Center). And we have made progress in technical questions like the relation between nilpotent superfields, supersymmetry breaking and branes; or in understanding the essential role played by the field geometry in some multifield inflation scenarios.

Ana Achúcarro (Leiden, The Netherlands)
Renata Kallosh (Stanford, CA, USA)
Andrei Linde (Stanford, CA, USA)
Diederik Roest (Groningen, The Netherlands)
Jan Pieter van der Schaar (Amsterdam, The Netherlands)
Koenraad Schalm (Leiden, The Netherlands)

Large Surveys of the Great Andromeda Galaxy

10 - 14 July 2017 @Oort

The primary goal of this workshop was to bring together members of the recent large M31 survey teams (PHAT, PAndAS, and SPLASH), experts in galaxy formation theory, as well as Milky Way and nearby galaxy experts (although this latter group was a bit under-represented due to a large meeting held in Germany the same week). These groups met to discuss both the primary results of the surveys and to consider what the path forward is for future large surveys, and how combining what they have taught has advanced our understanding of M31 and the Local Group.

Some specific developments of the workshop included development of several collaborative efforts that may result in either publications, or the development of shared data products across the teams. This includes an effort to combine the spectroscopic observations from all three survey teams, and at least two projects involving theorists fitting their models or simulations to observations by parts of the surveys teams. Additionally, a number of discussions in the workshop resulted in tangible progress on long-term plans for the next steps in large surveys of M31. For example, a plan was hatched to begin pooling the observational resources of many of those at the workshop with Keck telescope access, providing a more efficient use of this precious community resource for studying the M31 system. There were also a set of discussions of what the capabilities of the next generation of multi-object spectrographs will provide for advancing the state-of-the-art of M31's stellar halo. While these efforts (some specific examples discussed include WFIRST, the Prime Focus Spectrograph, or the Mauna Kea Spectral Explorer) are still in the planning or design stage, the workshop was successful in leading to a coordinated discussion of these planned capabilities, allowing several participants to bring this back to the projects' design teams, as well as laying the groundwork for future large surveys when these facilities are complete.

The format of the workshop combined traditional presentation-oriented morning with free-form "unconference" discussion in the afternoons, as well as a "hack day" to provide some concentrated work time. The Oort space fed well into these unconventional elements, providing ample secondary spaces (beyond the lecture room) to allow these unconferences and hacks to take place. The hack day was particularly effective, leading to a projects that have at least the potential to provide either future publications or result in pooled efforts between the groups represented at the workshop. The unconferences also led to several effective discussions, although they were a bit more mixed, especially in the latter part of the workshop: some of the days had difficulty filling up the allocated spaces and timeslots with discussion items. This element may have worked better if a larger fraction of the participants had experience with a meeting formatted in this way in the past, or alternatively a bit more effort beforehand to solicit unconference topics from the participants.

Michelle Collins (Guildford, United Kingdom)
Karoline Gilbert (Baltimore, MD, United States)
Vincent Henault-Brunet (Nijmegen, the Netherlands)
Erik Tollerud (Baltimore, MD, United States)
Dan Weisz (Berkeley, CA, United States)

The future of singular perturbations and the analysis of multiscale systems

10 - 14 July 2017 @Snellius

The central theme of the workshop was "singular perturbation theory", an area that is of great importance in and beyond applied mathematics. Applications of this theory can be found in various areas of science were phenomena take place on more than one temporal or spatial scale. As a consequence, many of the numerous recent developments in the theory of singular perturbations have been achieved in special contexts driven by specific applications. However, the impact of these novel mathematical insights typically goes way beyond the setting of the original application. This workshop brought together a core group of internationally renowned mathematicians who have, in recent years, been leading the development of the field of singular perturbations - some of them by (also) working in neuroscience, others in ecology or in climate research. During the workshop, the general mathematical impacts of the various developments were assessed. For instance, the underlying mathematical structure of the models suggest that insights in canard theory obtained in studies on brain activity may be relevant in the existence and stability analysis of a certain kinds of invading tumor fronts.

The workshop schedule dedicated each day to a different subfield: Singularly perturbed problems in applications, Discrete and stochastic singularly perturbed problems, Canards and mixed-mode oscillations, Pattern formation (2 days). In addition to presentations of the leading experts in the field, we closed every day with a long forward-looking discussion led by senior authorities in the field to identify open problems and new promising directions of research. The high quality of the presentations and discussions created an inspiring atmosphere and encouraged a vivid dialogue and many smaller focus groups during the afternoons. Not only did these focus groups involve research among existing collaborators, but there were also many new collaborations formed in response to the challenges of solving exciting open problems. We also ensured to invite a number of PhD students and postdocs. These promising junior researchers had opportunities to make informal presentations, and spent considerable time talking one on one and in small groups with senior researchers, and with each other, all of which provided a tremendous benefit to their research.

During the final discussion on the last day, at least three highly promising research directions were identified: development of rigorous techniques for pattern formation in 2-D, analysis of systems with heterogeneities and the influence of noise on the dynamics of differential equations. Progress in any of these three directions will have a direct impact in the larger applied sciences community as they lie on the bases of many applications. For instance, many mathematical models assume some kind of homogeneity of the parameters in the models, while in the applications these parameters are almost always heterogeneous and the effect of these heterogeneities should be investigated. Interestingly, the first direction related to rigorous techniques for pattern formation in 2-D can also be seen as one of the original starting points of the more current research into singular perturbations. So, while a lot of advances have been made over the past decades, there is still a lot of work to be done and many open questions and challenges remain.

In general, the workshop was well received by the participants and it was agreed to repeat a workshop with this focus and format on a regular basis in the future.

Martina Chirilus-Bruckner (Leiden University, the Netherlands)
Arjen Doelman (Leiden University, the Netherlands)
Peter van Heijster (Queensland University of Technology, Australia)
Tasso Kaper (Boston University, United States)

Hamiltonian and Reeb dynamics

new methods and applications

17 - 21 July 2017 @Oort

Symplectic and contact topology has been very successfully applied to central questions in dynamical systems, and conversely the problems from dynamics greatly influenced the development of these fields. Our plan for this workshop was to focus on some high potential, exciting new applications of symplectic and contact geometry to dynamics.

We look back to a very exciting and fruitful week. All the themes we were planning to focus on were addressed during the workshop.

On the subject of Reeb dynamics, an interesting application of embedded contact homology was discussed by Cristofaro-Gardiner: he reported on very recent results (joint work with Hutchings), extending work of Hutchings and Taubes, on the number of distinct periodic Reeb orbits on closed contact manifolds. A very concrete outcome we would like to mention is the preprint by Gutt and Hutchings (arXiv:1707.06514), which was completed during the workshop. Also, Ginzburg and Gurel completed a major step in their work on pseudo-rotations of projective spaces.

On the theme of C^0-topology and barcodes, Seyfaddini explained to us how one can apply the theory of barcodes (and in particular the notion of Bottleneck distance) to study the group of Hamiltonian homeomorphisms (via Floer homology). This is a promising new direction bringing together several areas of mathematics and there is no doubt that this link between Floer theory and persistent homology can be further developed to generate new results. Also, in a similar spirit, Fabert (VU) gave a very interesting talk focusing on intriguing new connections between Hamiltonian PDEs, symplectic topology and model theory.

We believe that the short presentations by the Ph.D. students were a very successful part of the workshop: the talks by Alboresi (UU) on holomorphic curves in log-symplectic manifolds and Bakker (VU) on Hamiltonian dynamics of non-local equations were of very high level and demonstrated that symplectic geometry has the potential to connect to the research of several groups within the Dutch mathematical community.

Last but not least, we feel that a special mention is deserved by Polterovich's contribution: his work, which provides a link between symplectic displacement energy (a fundamental notion in symplectic topology) and the quantum speed energy (a bound on the maximal number of distinct states a physical system can pass through in given time), is absolutely groundbreaking and opens up new possibilities of interaction between symplectic topology and the fundamentals of quantum computation.

The workshop lasted 5 days, with every day 3 or 4 talks of 45 minutes. Thanks to the limited number of talks and their length (45 minutes), the workshop program left ample time for discus- sion. Tuesday afternoon was reserved for short presentations (20 minutes) by PhD students: these were attended by all participants with great interest. The talks were organized each day around a theme: this worked very well and created discussions that would often continue throughout the whole day!

The Lorentz Center provided excellent facilities and support. Lunch on Friday in the common room was very much appreciated by the participants, as it gave everyone the opportunity of a last discussion and of saying farewell to everybody. It was an excellent way of closing the workshop.

Hansjörg Geiges (Colgone, Germany)
Viktor Ginzburg (Santa Cruz, CA, United States)
Federica Pasquotto (Amsterdam, the Netherlands)

Comparative Affective Science

The intersection of biology and psychology

24 - 28 July 2017 @Snellius

Science

The goal of our workshop was to bring biologists and psychologists together to discuss the nature and measurement of animal emotions and current issues in comparative affective science. We framed the workshop around four core questions:

1. What does it mean to be well?
2. How can we know the affective states of nonhuman animals?
3. What role does anthropomorphism play in our science?
4. What can be gleaned from studying which species? What species should we be studying that we are not?

Presentation and discussion were centered around these questions, although less emphasis naturally emerged on question number four. Instead, a fifth question arose: can, and if so, how, can we separate affective from cognitive processing?

We are in the process of organizing a special issue submission to Phil Trans B (due mid-October) and have a number of other plans for pursuing a special issue should that Phil Trans B submission not be tenable. The proposed issue will begin with an introduction written by the three organizers and then have three main sections

- Current Issues in Affect (both basic science and applied/welfare science);
- Comparative and Translational Studies of Affect-Related Sociality;
- Anthropomorphism.

Section themes emerged out of discussions and debates with the participants. Each faculty member is slated to contribute to one or two articles and each trainee has been invited to contribute. In total, there are currently 12 unique articles planned.

The primary breakthroughs and aha! moments were related to realizing that the fields were using different language and different definitions. Therefore, we have started a definitions document that itself will become one of the articles that we hope will clarify terminology, allowing scientists to move the science forward.

Organization and Format. We started the workshop with a session in which each participant introduced himself or herself with 3 slides. This was very effective, but if we were to do this again in the future we would have timed the presentations and kept them to a total of 5 minutes max., or would have split up this session in two separate sessions spread over the first day.

We structured our workshop such that each day started with one or two "keynotes" on a given topic and then the rest of the day was left of discussion (either as the whole group or in small groups). Discussion groups were chosen in part based on participants' interests and in part to distribute faculty and trainees across groups. This format worked well, as it helped in formulating more focused and concrete ideas about a given subject.

We changed the specific timing of sessions a lot over the course of the week to accommodate interests and the flow of discussion. If we were to do it over again, we might leave the program less structured initially and provide information to participants ahead of time that specific structural features would be added as we went. In general, our changes removed structure (like took an afternoon that had 3 distinct

sessions and made it 1 big discussion session) - less structured seems to be more valuable - if the discussions are good. We had no problem stimulating really wonderful discussion, although we were concerned this might be an issue heading into the workshop.

General Comments to Future Organizers. Do have a back-up plan if people do not generate good discussion, but generally plan on the discussion being good and not having to spend a lot of organized time getting it going.

Eliza Bliss-Moreau (Davis, CA, United States)
Mariska Kret (Leiden, the Netherlands)
Jorg Massen (Vienna, Austria)

International ICT for Sustainability (ICT4S) Summer School

31 July - 4 August 2017 @Oort

The ICT for Sustainability (ICT4S) research community has coalesced over the last five years around a common set of research challenges that address the relationship between ICT and sustainability, focusing both on how to make ICT greener, and how to leverage the power of ICT to develop sustainable solutions in diverse areas such as urban planning, transport, buildings, food, clean water, and sustainable development. After four successful conferences in Europe (Zurich in 2013; Stockholm in 2014; Copenhagen in 2015; and Amsterdam in 2016), ICT4S will be venturing across the Atlantic for its first North American conference, in Toronto in May 2018 (see http://ict4s.org for more information).

The conference has been successful in developing an interdisciplinary community of researchers, and providing a platform for discussing and presenting new ideas. However, in planning for the next conference, we realized that we currently have few opportunities in place to nurture the next generation of ICT4S scholars. This first ICT4S summer school has been designed to fill this gap.

We invited leading thinkers in the field to contribute lectures on interdisciplinary topics. This sparked broad discussion and reflection. The event attracted a broad range of 34 postgraduate students and researchers from different disciplinary backgrounds. Much of the program was dedicated to working groups on topics of interest of the attendees. All attendees, and especially the PhD students, expressed appreciation for the the informal and inspiring atmosphere, and the constructive research discussions that resulted in abstracts and time plans for the development of six scientific papers to be developed by six different groups of participants from various disciplines and with different seniority.

We were five main organizers who with good support from the team from Lorentz Center set up a program for the week. The program consisted of alternating seminars, working groups and social activities. Altogether, there were ten lectures held by professors from nine universities from seven countries on three continents. Moreover, there were between two and three working sessions each day, with groups of PhD-students formed the first day, and complemented with professors. Each group aimed at, and succeeded in, developing both a good start to a research paper and a time plan for finishing it in time for submission to the next ICT4S conference. The preliminary titles being researched as a result of our workshop, are:

- Urban bike sharing and the role of ICT as a success factor
- An exploratory study on the effects of disconnecting without compromising necessities
- On the verge of giving up: sustaining ICT research in danger zones
- Spectrum-based energy hotspot localization
- The footprint of things
- Modular smartphones as a service and their sustainability

In summary, we are happy our Summer School has been successful in creating new collaboration among young and energetic researchers: they are the hope of the future of research in ICT4S, and in fact of our future.

Steve Easterbrook (Toronto, Canada)
Lorenz Hilty (Zurich, Switzerland)
Mattias Höjer (Stockholm, Sweden)
Patricia Lago (Amsterdam, the Netherlands)
Birgit Penzenstadler (Long Beach, CA, United States)

Microbial Darwinian Medicine

A Workshop at the Interface of Medicine and Microbial Eco-Evolutionary Biology

14 - 17 August 2017 @Oort

Our workshop on Darwinian Microbial Medicine addressed the current understanding of how changes in the microbiome affect human health, and how we can move from correlative patterns to causative effects. To do so we need a joined approach, which transcends the boundaries of clinical, bioinformatical and experimental biological fields. The workshop therefore brought together a group of 42 international, multidisciplinary scientists in the respective fields, to further future approaches in Darwinian medicine. Early- to midlevel career scientists were particularly well-represented, the gender balance was ~50/50, and the small group size worked great for active participation.

The workshop days were divided into four topics;

- From a healthy to a diseased host,
- Genomics-based epidemiology and diagnostics,
- Antibiotic resistance,
- Evolution of pathogens.

During the workshop, and while writing a white paper, we were excited to notice the extensive overlap between talks and discussions across the topics, allowing us to identify how an evolutionary medicine approach may contribute to targeting challenges such as detecting transmission of pathogens and predicting the evolution of antibiotic resistance.

The excellent facilities and services by the Lorentz Center provided the best possible framework for a productive workshop. Both participants and organizers were very satisfied with the discussions. We found that a format with three shorter talks followed by discussions in groups headed by the speakers, and summed up in plenum, were a useful format where everyone had a chance to voice their thoughts. The majority of participants had a role either as session chairs, discussion leaders or speakers, which facilitated introduction to the group. That we stayed in the same hotel, and had dinner together on the boat and in town, further allowed for more informal discussions throughout the workshop.

Take-home messages of the various talks were live-tweeted with the #MicroDM, gaining interest from the broader scientific community. Participants connected though twitter during and after the meeting, and posting and discussion of relevant papers here have continued subsequently. As a more tangible product of the workshop we are currently working on a white paper aimed for the journal "Evolution, Medicine & Public Health". The last afternoon was used for synthesizing the meeting in plenum for this purpose. There was support for arranging a follow-up meeting in 2-3 years, with an interest in further expanding the interdisciplinarity by also inviting social scientists working on the limiting antibiotic resistance spread and communication between clinicians and scientists. We hope, and expect, to see novel collaborations arise from the workshop.

Sandra Breum Andersen (New York City, NY, United States)
Jesse Shapiro (Montreal, Canada)
Christina Vandenbroucke - Grauls (Amsterdam, the Netherlands)
Marjon de Vos (Wageningen, the Netherlands)

Movement

New Sensors, New Data, New Challenges

21 - 25 August 2017 @ Oort

Science

The main goal of our workshop was to bring together movement ecologists and data scientists to investigate challenges stemming from new technological developments in movement data collection in the last five years. We had three scientific aims:

- how can we work with new types of data that have appeared through development of new sensors,
- what computational and visual methods exist or can be designed for these new data,
- how can we inform the methods with ecological knowledge.

To achieve these aims, we had two parallel activity streams that looked at these problems from a conceptual and a practical perspective. The conceptual view was through development of a research agenda for movement analytics. We worked on this in two ways: we prepared a pre-workshop survey asking what participants thought were the big challenges for movement analytics in the context of movement ecology. During the workshop we discussed the identified challenges in two rounds of break-out groups, from which elements of an agenda were compiled. We plan to continue with this, with the goal to write a paper with organizers and volunteer participants as co-authors.

The second, more practical view of looking at new data was through hands-on data challenges. To the initial formal data challenge on goose flight, which we prepared and distributed to the participants prior to the workshop, four other data challenges were contributed ad hoc at the workshop by participants from ecology. These were on four different species (grey seal, European eel, osprey and cory shearwater) with four very different types of multi-sensor data collected on the movement of each animal species. During the workshop the participants worked in small groups on each data set, which resulted in a number of varied data science approaches, from context-aware analysis (linking movement data to remotely sensed satellite data) through geometrical modelling (for problems of segmentation and classification of behaviour) to visual analytics (for exploratory approaches to complex movement data). Both the ecologists who brought the data and the data scientists working on the data found something new and interesting and benefited from group work on problems where both ecological and data science expertise were present. We expect that some of the interdisciplinary collaborations that were initiated in the data challenges are likely to continue after the workshop and will result in joint publications and future collaborative work.

Organization/Format

Our workshop consisted of several types of activities:

- Keynote addresses by prominent scientists: we only had three instead of four of these, due to two unexpected health- and family-related cancellations. We had the two planned GIScience and computational geometry talks, respectively, and to cover one of the two cancelled ecology talks, one of the scientific organizers jumped in with an overview of data and research problems in movement ecology. The talks brought together participants to the same level of background information on what is the state of the art of movement analytics for ecology.

- Poster session for early career researchers: this went well and early career researchers got useful input on their work.
- Data challenges: as specified above, this worked extremely well and we had other ecological participants (those who did not volunteer for the informal challenges) saying they were sorry they did not bring their own data. So next time we might want to push a bit more on this before the workshop.
- Research agenda: this also went very well as specified above.
- PechaKucha presentations: we tried a new type of a speed-introduction session, where, instead of participants preparing the usual slides, everyone had to show only photos related to him/herself and their work. This worked very well and we will consider re-using this method again at other events.

Finally, we would like to note that the facilities of the Lorentz Center were extremely suitable for this type of a mixed workshop (with both talks and hands-on work in smaller groups). This and the support of the friendly and helpful Lorentz Center staff led to a very successful event and we would like to thank everyone at the Lorentz Center for their help.

Kevin Buchin (Eindhoven, the Netherlands)
Urška Demšar (St. Andrews, United Kingdom)
Kamran Safi (Seewiesen, Germany)
Robert Weibel (Zurich, Switzerland)

Bayesian and Nonlinear Inverse Problems

28 August - 1 September @Oort

Science

Description and aims: For the workshop we focused on two 'hot' topics in inverse problems with a lot of recent development namely Bayesian inverse problems and non-linear inverse problems. Both fields became very active within the last years and have various applications across different areas of science.

Bayesian inverse problems theory has been developed by different groups over the past years and there was the need to discuss these approaches within one workshop.

Another goal of the workshop was to increase the interest of the Bayesian community in non-linear inverse problems, and to increase the interest of people working in non-linear inverse problems in Bayesian methods. The field of nonlinear inverse problems is even more diverse than Bayesian inverse problems. It is a very timely topic since most of the really interesting applications in inverse problems are non-linear. One of the big open problems in this area is the question how to do proper uncertainty quantification, which links the two workshop topics to each other.

As organizers of the workshop, our main goal was to bring different communities together as there was little or no exchange between the groups so far. Moreover, we wanted to discuss the state of the art, possible links between the two areas, and open problems.

Outcome

We had a very successful conference with vivid discussions and extensive exchange of ideas. Almost all key participants attended the workshop and there were only few cancellations.

During the week we had many fruitful and long discussions on different approaches. For instance, there was a very long and intense discussion on 'large noise' in the deterministic inverse problem literature. If one things of an inverse problem from an operator point of view, white noise in inverse problems is difficult since it is not square-integrable. From the statistics point of view, however, the white noise framework is quite convenient to work with and does not lead to these issues.

We also organized two open problem sessions, where challenging open problems were presented and discussed. During these discussions, it became apparent that the different communities are typically strong on specific aspects of a problem such as fast computability or theoretical guarantees. We received positive feedback from the organizers of these sessions.

Organization/Format

The Lorentz Center was very well-suited for our workshop. It is an excellent location for groups of around 50 participants. We received a lot of positive feedback from the participants. Many of the participants mentioned that they enjoyed to discuss problems in smaller groups in the offices during the lunch breaks.

The number of talks and the time for discussion seemed to be well-balanced for a workshop on this topic. As a new format we had two problem sessions, which led to a lot of interactions.

We thank the Lorentz Center staff for the local support. They have done a great job. In particular we want to thank Martijn Fritsen for being an excellent and very supportive workshop coordinator.

Fabian Dunker (Christchurch, New Zealand)
Thorsten Hohage (Göttingen, Germany)
Enno Mammen (Heidelberg, Germany)
Johannes Schmidt-Hieber (Leiden, the Netherlands)
Aad van der Vaart (Leiden, the Netherlands)

Included in training and work

Transforming policies and practices for disabled people

26 August - 1 September 2017 @Snellius

People with disabilities are much more likely to be unemployed or underemployed than people who do not have disabilities, and in the developed world the percentage of disabled people in work is going down rather than up. Our interdisciplinary workshop aimed to bring together leaders of Disabled Peoples Organizations (DPOs), training providers, education researchers - particularly those involved with the innovative Universal Design for Learning paradigm - and social scientists and researchers to reveal and analyze barriers to education and work, and measuring the impact of focused interventions.

We drafted a research-based report before and during the workshop. This will be presented first to the UWV on 29 November of this year in an event involving workshop attendees and UWV staff. It will then be sent to a variety of national, EU and international agencies afterwards. Workshop attendees and their colleagues are encouraged to use it in their own work.

We generated extensive data about research gaps. This will be the focus of a session at the 3rd International Disability Studies Conference in Amsterdam in December 2017, which is aimed at stimulating new directions for productive and much-needed research.
Also during the workshop, we began to work on a book proposal based on our findings. A core group has formed to carry this forward, and we expect the proposal to be submitted this autumn. One or more papers are also likely.

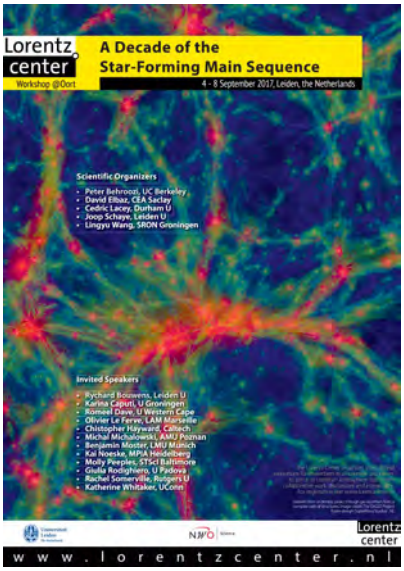
Realizing that the literature on vocational education and work for disabled people focuses on the developed world and often ignores intersectional issues that contribute to poverty was an issue that emerged during the preparatory stage. This insight was further developed during the workshop. We also found that much of the existing literature fails to look at the barriers mentioned by disabled people themselves, including bullying in school and work, discrimination, and rigid employment and HR practices. Finding a way to connect directly with Human Resources professionals is definitely needed.

We found the format and venue very conducive to the kind of work that we needed to do. We worked in small groups, included an arts-based activity (the inclusive dance workshop) that energized the group, and tried some methods for identifying and prioritizing issues that were really helpful.

Geert Van Hove (Ghent, Belgium)
Sofie Sergeant (Amersfoort, the Netherlands)
Mitzi Waltz (Amersfoort, the Netherlands)

A Decade of the Star-Forming Main Sequence

4 - 8 September @Oort



Description and aims

A tight correlation between the star-formation rate and stellar mass of star-forming galaxies, discovered roughly a decade ago, has been observed to exist over most of the cosmic history and has become known as the galaxy star formation main sequence (MS). This workshop was the first-ever meeting dedicated to the galaxy MS. Our aim was to review the main observational and theoretical studies, identify causes of observational inconsistencies and biases, explore the main scientific and technical challenges in constraining galaxy evolution processes, and outline future directions.

Workshop outcome. During the workshop, it seems that we have reached a consensus that the galaxy MS is a generic outcome of the galaxy growth via the baryon cycle. Gas plays a dominant role in shaping the MS and its evolution. We also seem to reach a consensus that there is a serious tension between the observational constraints on the MS around z~2 and theoretical predictions. Various adjustments in theory were discussed. We identified a number of potential issues which could cause inconsistencies between different studies and made a list of recommendations to overcome or reduce the impact of these issues. An interesting new development was also raised during the workshop regarding the possibility of a tight starburst sequence at high redshift and low stellar masses.

Regarding future directions, we agreed that to better understand the MS, we need to understand its dependence on key parameters such as size, morphology, gas content and environment. With upcoming facilities, we will make important progress in these directions. We will also obtain spatially resolved observations, observe the MS out to higher redshifts and lower stellar masses.

Thanks to galaxy MS workshop at the Lorentz Center, we are currently preparing a proposal for a review paper on the galaxy MS to the Annual Review of Astronomy and Astrophysics journal. Should the proposal be accepted and therefore invited for publication in the journal, we will certainly notify the Lorentz Center.

Organization and format

Following advice from the Lorentz Center staff and advisory board, we used a very interactive format for the workshop. Each day we focused on a particular topic to ensure participation from both observers and theoreticians, as well as observers specializing in different wavelength regimes. A pedological review talk was presented at the start of each day, followed by short talks on the relevant topic.
We reserved ample time for plenary discussions and breakout groups. We assigned chairs to lead, moderate, and summarize the discussions, to ensure the discussions are relatively focused and effective.

We have received a lot of positive feedback from the participants regarding the format. Many people have said that the workshop has the right balance between talks and discussions. The atmosphere is engaging, friendly and constructive. It was very easy to people to have discussions in small groups in the coffee room or in their own offices. The Lorentz Center staff was very helpful and always very quick to react throughout the workshop.

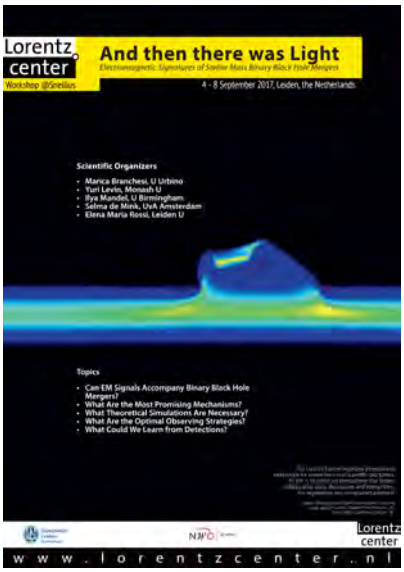
Suggestions to the Lorentz Center. For the social event, we chose the beach restaurant. It was very nice and people really enjoyed talking to each other in a relaxing and cosy atmosphere. If possible, it would be even better to arrange the return bus for a later time (e.g., around 9:30 pm instead of around 8 pm).

Peter Behroozi (Tuscon, AZ, United States)
David Elbaz (Saclay, France)
Cedric Lacey (Durham, United Kingdom)
Joop Schaye (Leiden, the Netherlands)
Lingyu Wang (Utrecht, the Netherlands)

And then there was Light

Electromagnetic Signatures of Stellar Mass Binary Black Hole Mergers

4 - 8 September 2017 @Snellius



The workshop was focused on understanding the possible electromagnetic signatures of binary black hole mergers. We attempted to bring together theorists from different communities and key observers to critically evaluate the full range of possible signatures. The workshop aimed to identify the most promising mechanisms for detectable EM signals and the most promising strategies for observing them, construct a roadmap on the side of theoretical modeling, and enhance interaction between theorists and observers.
Overall, the workshop was very successful. We were able to attract the top scientists in the field, and had extremely productive and engaging discussions. The workshop format, mixing a few key introductory / overview talks, short discussion starters with following discussions, and extensive free discussion times in break-out sessions (some self-organized, some organized pseudo-randomly by us to encourage participant mixing), worked particularly well.

One entirely unexpected event, which both made the workshop extremely timely and threatened to overtake the discussion, was the discovery of a binary neutron star merger with an accompanying electromagnetic signal just a few weeks before the workshop. However, many of the topics discussed in the context of electromagnetic counterparts for binary black hole mergers, such as photon diffusion to get energy out and associated timescales and luminosities, proved very relevant for the interpreting the observed binary neutron star merger, as well as in other contexts such as tidal disruption events.

Some papers inspired by workshop discussions have already appeared (e.g., Michaely and Perets, https://arxiv.org/pdf/1710.09893.pdf) and others are in preparation.
We are particularly grateful to the Lorentz center staff for support in submitting the proposal, organizing the workshop, supporting it financially, and running the workshop. As always, it was a very exciting and stimulating experience.

Marica Branchesi (Urbino, Italy)
Yuri Levin (Clayton, Australia)
Ilya Mandel (Birmingham, UK)
Selma de Mink (Amsterdam, The Netherlands)
Elena Maria Rossi (Leiden, The Netherlands)

Fellow Brethren, Slaves and Companions

Human/Non-Human Animals Relations in Transformation

11 - 15 September 2017 @Snellius

During the last decade human/non-human animals relationships have raised interest of scientists and have been under the increased scrutiny of the general public. Our relationships with other animals present some issues that need to be discussed, for their scientific and societal consequences.

The workshop has been articulated around three main areas of interaction between human and non-human animals: farming, animal experimentation, companion animals (with special focus on Animal Assisted Interventions). Each of the areas has peculiar features and characteristics. The occasions of direct confrontation among the different worlds of animal use are very rare. Therefore, the aim of this workshop was to verify whether the nature of our relationships with other animals in different fields of application and our concern for their welfare is significantly different depending on the context and if this heterogeneity needs to be addressed towards harmonization of attitudes and practices.

18 participants from different European countries and areas of expertise gathered at the Lorentz Center from September 11th to 15th to discuss the above issues in relation to two main questions raised by the organizers:

- How can we define human/non-human relationship and what are the implications of the definition in the practices of human/non-human interaction?
- How can we define animal welfare?

During the five days short talks have been given about the two questions in the three different fields of human/non human interactions. The talks were conceived to trigger the discussion that took place in three different workgroups, whose composition changed day by day. The formula has been a success, because all participants had the occasion to actively participate and exchange ideas both on theoretical points and possible practical outcomes of the workshop. The discussion has been highly articulated and intense. Many interesting hints have been put on the table and above all two main issues seem to be shared by all the participants as paramount.

First, the concept of animal sentience has been recognized as the most important turning point in the process of transformation of our relationships with animals. Far from being acquired or agreed upon, animal sentience should be the subject of massive research not only in its scientific dimension, but also with regard to its effects on ethics, law and in general the human perception of animals. Second, all participants recognized that profound differences exist about how animal welfare is conceived and put into practice into the different contexts of interactions. At the same time, it has been acknowledged that it seems very difficult that such differences can be easily reconciled. Nonetheless, a reasonable aim should be to raise the level of the acceptable threshold in all the fields of interaction, accepting that some differences maybe will still persist.

At the end of the workshop the questions raised as a starting point have been better defined and understood (rather than being completely answered). Such a better understanding will be the focus of a forthcoming research paper all the participants agreed to work on collectively. Possibly, in the future this paper will represent the background for the application for a Cost Action (involving also other scientists working in the field).

Finally, organizers agree that the workshop has been a success in all its different aspects and that it reached the goal of building a small community of researchers. For the achievement of this aim the Lorentz Center and its staff provided the best conceivable environment from both the scientific and the organizational points of view.

Clemens Driessen (Wageningen, the Netherlands)
Maria-Jose Enders-Slegers (Heerlen, the Netherlands)
Marita Giménez-Candela (Barcelona, Spain)
Simone Pollo (Rome, Italy)
Augusto Vitale (Rome, Italy)

Applied Mathematics Techniques for Energy Markets in Transition

18 - 22 September 2017 @Oort

This document provides a report on the Lorentz Center Workshop "Applied Mathematics Techniques for Energy Markets in Transition". We gratefully acknowledge the excellent support from the Lorentz Center staff in organizing this workshop. This event, including ample funding for the invited speakers, would not have been possible without our sponsors: the Netherlands Organization for Scientific Research NWO and the Flemish FWO Scientific Research Community "Stochastic modelling with applications in financial markets".

This workshop has been motivated by the fact that the world is witnessing a tremendous change in its energy supply mix, demand behaviour and market dynamics. Pivotal developments include ambitious climate change and environmental policies, the progressive move to sustainable energy, the (at times sudden) abandonment of polluting electricity generation, the growing availability of liquefied natural gas and shale oil and gas. This all has a significant impact on the core business and risk exposures of energy companies, on commodity and energy prices, and also on the many financial energy derivative products traded. Changes in market mechanisms and products demand novel mathematical models, stochastic and deterministic, microscopic and macroscopic models, and changing pricing techniques, defining new research areas within the field of applied mathematics. To cover the different aspects, we considered three relevant, contemporary mathematical themes:

- Risk management issues related to the energy transition.
- Energy derivatives facilitating the energy transition.
- Decisions for demand flexibilization in energy intensive industry.

With the workshop, we achieved our main purposes:

- Presentation of top research on state-of-the-art models, options and numerics for energy markets in transition.
- Identification in various interdisciplinary group discussions of major challenges in current energy markets.
- Lively interactions and mutual understanding between applied mathematicians, computer scientists, and economics researchers on the topic of a major transition of energy markets and risk management.
- Strengthened and expanded links of (existing and planned) research networks. In particular, various workshop participants, including the workshop organizers, are active in the definition and implementation of a new Marie Curie European Training Network SWING.
- Discussed new benchmark problems. In this direction, some applicants take part in an initiative entitled "BENCHOP high-D" lead by the University of Uppsala.

In total 45 researchers from 13 different countries participated in the workshop stemming from both the academic and industrial worlds. The ample discussions between the participants extended from the lecture room to the coffee and tea breaks in the common room and the dinners as well as to the very pleasant conference trip to the beach of Katwijk. Summarizing, all the goals of our workshop have been accomplished, and we therefore consider it to be a highly successful event.

Matthias Ehrhardt (Wuppertal, Germany)
Karel in 't Hout (Antwerp, Belgium)
Kees Oosterlee (Amsterdam, the Netherlands)

Space Weather

A Multi-Disciplinary Approach

25 - 29 September 2017 @Oort

Space weather refers to conditions on the sun and in the solar wind, the Earth's magnetosphere, ionosphere, and thermosphere that can influence the performance and reliability of space-borne and ground-based technological systems and can endanger human life or health. As our society continues to rely more on such advancing technologies, space weather will increasingly play a significant role in human activities, approaching that of terrestrial weather.

The study of space weather has traditionally been carried out using standard techniques and tools found in space physics such as time series correlational analyses. These techniques, although having the advantage of being fast and simple, are sometimes not adequate or complete because the Sun-Earth system is a complex nonlinear system. On the other hand, researchers in the fields of mathematics, information science, computer science, machine learning, data mining, have developed, over the last several decades, tools that can handle complex nonlinear systems and are eager to apply these new tools to new difficult problems.

The aim of this workshop is to bring together researchers from space weather, space physics, mathematics, computer science, information science, machine learning, data mining, etc. to foster symbiosis and cross-fertilization across the fields.

The topics that have been discussed include: Information theory and system science approaches to the solar-terrestrial problem; Pattern recognition, deep learning, and general feature selection in solar forecasting; Data mining and machine learning for Space Weather.

One important outcome of the discussions between solar physicists and machine learning experts was the idea to craft and pose a Solar Prediction Grand Challenge to machine learning practitioners in the trending mold of Kaggle.com. Workshop participants crafted the initial design for such a challenge during the meeting and formed a coordinating committee to develop and deliver a final product.

Self-organizing working groups formed during the week following an un-conference format, focusing on specific, well-defined problems, which can be generally divided into:

- Algorithms to automatically identify events (e.g. magnetic reconnection in planetary magnetospheres, or features such as active regions, coronal holes, coronal mass ejections in solar images) to be used in place of traditional, time-consuming, and non-reproducible manual selection;
- Knowledge discovery: methods to study causality and relationships within highly-dimensional data, and to cluster similar events, with the aim of deepening our physical understanding;
- Forecasting: machine learning techniques capable of dealing with large class imbalances and/or significant data gaps to forecast important Space Weather events from solar images, solar wind and geospace in-situ data.
- Information theory: a powerful method to discover causalities and nonlinear relationships in the data; applications of information theory to solar and Earth's magnetospheric data were discussed.

All participants appreciated the unconventional format of the workshop, and the office space at their disposal. Many small groups formed to work on specific space weather topics and these groups will continue working even after the workshop ended.

A follow-up meeting or workshop is expected to take place within a couple of years.

Another, long-term proposal discussed during the workshop was the idea to write a white-paper on this topic, to circulate within funding agencies. A general consensus was reached that progress will require multi-disciplinary cooperation and targeted funding.

Finally, a paper summarizing the meeting has been submitted to the Earth and Space Science magazine of the American Geophysical Union (EOS) to spotlight the event. EOS is a leading magaznie that covers the latest Earth and space science news and publishes the magazine in print as well as online (https://eos.org/).

Enrico Camporeale (Amsterdam, the Netherlands)
Jay Johnson (Berrien Springs, MI, USA)
Simon Wing (Laurel, MD, USA)

Optimal Optical Coronagraphs

25 - 29 September 2017 @Snellius

High-contrast imaging instruments based on coronagraphic techniques have proven to be essential for observing the few giant exoplanets that have been imaged so far. Still, several challenges remain in the development of ground- and space-based instruments that will be sensitive to a substantially larger population of planets. The Optimal Optical Coronagraph (OOC) Workshop gathered researchers working on exoplanet instrumentation to stimulate the emergence and sharing of new ideas.

We consider our 5-day workshop to be a big success. The program effectively encouraged discussion and boosted mutual progress on outstanding issues identified by the group. Interactive talks and panel discussions allowed the attendees to share their knowledge and experience with coronagraph optimization, testing, and operations. Once the problems were identified, participants split into collaborative groups to tackle them. These splinter sessions, at the core of the workshop program, gave the participants the opportunity to combine efforts and make rapid progress on critical issues.

Experience with the format of the workshop:

- The discussions were useful and occasionally intense. All attendees contributed.
- The "crazy ideas" sessions and resulting splinter sessions really produced crazy, though useful, ideas.
- The 2.5 days of only loosely scheduled program time was used to its fullest with interactive (splinter) sessions. The progression of splinter session topics flowed naturally.
- All splinter groups made progress on novel concepts, computer codes, and documentation.

The main outcomes of the workshop:

- A plan to publish a series of three conference proceedings at
- 'SPIE Astronomical Telescopes + Instrumentation' in Austin, TX in June 2018 summarizing progress made during the workshop:
- Methods for coronagraph optimization and performance metrics (led by Garreth Ruane)
- Review of WFS/C and CDI (led by Nemanja Jovanovic)
- Technologies and pathways (led by Frans Snik)
- Large amount of documentation in a shared Google drive folder: https://drive.google.com/drive/folders/0ByGd8kr1gdDcS296T1I3RHJIT3M?usp=sharing
- New optimization algorithms for coronagraph systems with codes are being made freely available, with an emphasis on combining approaches developed by different researchers.
- We identified new pathways for future development: Photonic integrated systems, optical elements with combined functions to enable minimal systems design, photon sieves, one-dimensional space telescopes, etc.
- We identified new pathways for international collaboration, including a student exchange network and community support on experimental testbeds.
- We initiated the organization of a follow on workshop to be held in California in 2018.

Elsa Huby (Paris, France)
Johan Mazoyer (Baltimore, MD, United States)
Garreth Ruane (Pasadena, CA, United States)
Frans Snik (Leiden, the Netherlands)

IODINE

Biogeochemical Cycle and Human Health

4 - 6 October 2017 @Snellius

Description and Aims

The IODINE workshop has brought together scientists at the cutting edge of iodine science in Europe to discuss innovative approaches to a number of interdisciplinary research themes centered on iodine, and to prepare an application for an Innovative Training Network (ITN) in the framework of the Marie-Skłodowska-Curie Actions of the European Commission's H2020 program. All academic and almost all non-academic partners were present (except FERA, York, UK, and GSC, Chiba, Japan), as well as 2 of the proposed visiting scientists.

The expected Tangible Outcome of the Workshop is the improved ITN application to be submitted before 17:00 on Jan. 17, 2018.

Scientific breakthrough/"Aha" moments

In the Introduction, the need for answers to the 'So What' questions, innovative developments, and relevance of the ITN to the career of the Early Stage Researchers (PhD students) to be trained in it were emphasized. As to possible prospective other partners, it was decided that they should be sent a short version of the program, with an invitation to define a relevant ESR project, to be selected by the Theme Leaders. The most important questions discussed in the Thematic Sessions were:

- **Iodine Enzymology** C1) haloperoxidases: evolutionary development and its relation to physiological role and halogen specificity, and the structural basis of the latter, C2) Se-deiodinases: purification by affinity chromatography to address the role of Se and the identity of the endogenous reducing cosubstrate, role of conformers of the thyroid hormone, and presence of deiodinases in animals that lack a thyroid gland, and C3) possibility to catalyse sustainable oxidative iodination by haloperoxidases and functional models.

- **Metabolism and Accumulation of Iodine** B1) What is exactly the mechanism of cell wall/ apoplastic accumulation, and are there - as suggested by the different isotopic ratios between inorganic I (I- + IO3-) and accumulated I - hitherto unknown sources of I- B2) how exactly is the antioxidant I- released from its stored form in brown algae B3) what is the contribution of the various algae, in particular macroalgae, to biological iodovolatilization, and can advantage be taken from biological systems for sustainable iodine production?

- **Atmospheric Chemistry** D1) the effect of iodine on the climate gas ozone in the troposphere, consumed in the volatilization of I- as HI and HOI in the ocean and Mediterranean: location, time, and extent of emissions, and their dependence on temperature, biology, and ocean agriculture; rate constants, heterogeneous reactions, aerosol production, D2) light and stress induce the emission of halocarbons by haloperoxidase reactions in algae, such as bromoform, which leads to breakdown of ozone in the stratosphere; also chloroform in soil as a product of fungal chloroperoxidases, D3) effect of iodine via ozone on climate and quality of air, ecosystem, and crop have an impact human health by another path than that of the thyroid hormones.

- **(Human) Health and Nutrition** E1) Universal salt iodization is the main strategy, but there are indications that this is insufficient during pregnancy and lactation, and it is undermined by incentives to decrease salt intake for other reasons. E2) bioavailability and of iodine and other trace elements in seaweed, difference in between organic/inorganic speciation, other effects of seaweed (fibers, associated microorganisms), iodine content of imported food; E3) reasons for variable recommendations and health effects in the world, risks of excess; E4) reliable monitoring of iodine status needed.

- **Bioinorganic Chemistry and Spectroscopy** A1) Identification of organoiodine compounds and iodine complexes in algae by X-ray absorption spectroscopy, by analogy to established results for Br; A2) Biomimetic models for haloperoxidase reactivity and selectivity by cyclodextrins (natural cavitand molecules) with ligands for vanadate, and H-bonding peptides; A3) Possible candidates for binding of I by H-bonding narrowed down by microscopy studies to components of the cell wall matrix: alginates, polyphenols; A4) Structural studies on non-covalent binding of halides by peptides possible by combined MS/IR using the IR-laser FELIX; A5) NMR and XAS studies of Se in deiodinase obtained by affinity chromatography using inhibitor bioconjugation.

Format of the Meeting

This Lorentz Workshop was unique in being a 3- rather than a 5-day meeting. The program in the application was slightly rearranged to take availability of speakers into account, with the 1st thematic session (C, 4 presentations) on the 1st afternoon, 3 more thematic sessions (B, D, E, 2-3 presentations) on the second day, the last thematic session (A, 3 presentations) on the last morning, and a General Discussion on the last afternoon. On the first morning, an Introduction session was inserted, in which the Lorentz Center and the individual participants introduced themselves, and the evaluation of the previous submission, possible solutions, and ways to address them in the Lorentz workshop were discussed. In the Thematic Sessions there was usually a lively discussion already during and immediately after each presentation. This also meant that the time scheduled for Discussion of each Theme was already used up at the end of each session, but that discussion had already taken place in direct relation to the presentations.

Other Comments

I have had nothing but positive feedback from the participants, they would like to come back. The only problem we encountered was an error in the schedule of bus 57 on the information screen.

Lisbeth Dahl (Bergen, Norway)
Martin Feiters (Nijmegen, the Netherlands)
Frithjof Küpper (Aberdeen, United Kingdom)

Non-animal Methods for Toxicokinetics

Meeting New Paradigms in Toxicology

16 - 20 October 2017 @Oort

The goal of the workshop was to bring together experts and stakeholders from science, industry, and regulation, including new generation toxicologists, to find ways to move the field of non-animal methods for toxicokinetics (absorption, distribution, metabolism and excretion of chemicals in a body) away from expert efforts to common practice within toxicological research and regulatory safety evaluations, e.g. through preparing OECD projects for producing OECD test guidelines. The workshop was scheduled around the following three topics:

1. **Non-animal methods for kinetics in current and next generation (non-animal) safety evaluations**
   All participants agreed that kinetics play a crucial role in the process of risk assessment and that its role is underestimated in present strategies. Key aspects that can be addressed with non-animal methods for kinetics are e.g. species differences, route-to-route extrapolations, and exposure based waiving. An even more important role for kinetics was foreseen in next generation (non-animal) safety evaluations, facilitating adequate design of in vitro toxicity studies, read-across and the translation of in vitro effect concentrations to external human exposure scenarios. Striving for inclusion of available non-animal methods for kinetics in current safety evaluations allows gaining the necessary experience for next generation approaches.

2. **Definition of the most essential kinetic parameters and strategy to increase regulatory acceptance**
   Based on the defined regulatory questions, a top four of essential human kinetic parameters were identified. These are (from high to low importance) 1) intrinsic hepatic clearance and identification of metabolites, 2) passive permeability (intestine, lungs, other barriers), 3) tissue-partitioning and the fraction unbound in blood, and 4) transporter kinetics within different barriers (e.g. intestinal, kidney, blood:brain, placenta). Readiness of non-animal methods for these parameters was discussed, as well as important experimental conditions. Finally, four methods were found to be most ready to start standardization within the organization for economic co-operation and development (OECD).

3. **Gaps and research needs**
   The final discussion focused on identifying the gaps and research needs. These particularly revealed a need for methods that allow characterization of transporter kinetics and the need for a lung model for absorption and a kidney model for excretion. The presented work on stem-cells, organoids and body-on-a-chip proved very promising tools to meet these research needs in the future, where the important question remains: how complex does the cell culture need to be to obtain useful data?

Overall view of the week

The first day was an introductory day with a tutorial on how to integrate in vitro-kinetic data in computer models to simulate blood-time concentrations. This introductory day was followed by 3 days with the different themes, ending Friday with a wrap-up/conclusions day and pitches on

different activities. The different sessions consisted of three talks followed by interactive discussions. This format was found to be well-balanced and assured vivid discussions throughout the week. Finding commitment from industrial participants for a full week at a workshop, was difficult and the final number of participants was slightly lower than anticipated. In addition, our co-organizer from Scitovation (USA) had to cancel on short notice for personal reasons. During the week, various PhD and MSc students from Leiden University (LACDR) spontaneously passed by to learn about the discussions. The overall feedback on the workshop content, discussions and facility was very positive.

Plans that followed from the workshop include the formation of an expert group on kinetics within the OECD to initiate standardization of non-animal methods for kinetics as selected during the workshop. In addition, the output of the workshop will be published as a position paper.

Peter Bos (Bilthoven, the Netherlands)
Hans Bouwmeester (Wageningen, The Netherlands)
Minne Heringa (Wageningen, the Netherlands)
Ans Punt (Wageningen, the Netherlands)

The Reality and Myth of AGN feedback

16 - 20 October 2017 @Snellius

Determining the role of AGN feedback in galaxy evolution remains a big puzzle in our understanding of galaxy evolution. Enormous observational efforts have been made to constrain the incidence, kinematics and energetics of powerful outflows as well as their role in providing feedback to their host galaxies. While a lot of progress has been made, we still face several observational and conceptual issues. It seemed an appropriate time to discuss them with members of several major research groups in this field.

The workshop featured 8 review talks and 15 short talks. These talks set the background for seven working sessions in the afternoons which covered the following key topics:

- Comparison of different IFU analysis techniques
- Electron density and outflow mass estimates
- Comparison of derived outflow energetic estimates
- Multi-phase nature of outflows
- The dominant powering source of outflows
- How to diagnose negative and positive feedback?
- The long-term impact of AGN on their host galaxies

The purpose of talks and discussions was to identify the relevant issues that hampered true breakthrough in the field. It became clear that the nature of AGN feedback is very complex and hard to grasp with the many limitations of available observations and assumptions being made. It was very beneficial for the workshop that observers working in different wavelength regimes as well as a theorist were present to make necessary cross-links. For example, optical observers got convinced that interferometric radio observations are essential to identify the presence of radio jets in a systematic way. It became clear the systematic multi-gas phase observations are critically required for a complete picture. Furthermore, it was concluded that AGN feedback may not have an immediate impact on their galaxies but is rather regulative and long time -making it necessary to understand the observations in concert with simulations.

The workshop was a true success and the participants are issuing a series of Comments and Perspective articles in Nature Astronomy (expect to be published in the March 2018 issue) to share the emerging thoughts and conclusions with the community. In addition, a few ideas for research articles have been identified and participants have been grouped together to work on those in the next year. The outcome of the workshop might help to guide and drive the direction of an entire community in the future.

Angela Bongiorno (Rome, Italy)
Chris Harrison (Munich, Germany)
Bernd Husemann (Heidelberg, Germany)
Vincenzo Mainieri (Munich, Germany)
Raffaella Morganti (Dwingeloo, Netherlands)

Characterizing Galaxies with Spectroscopy with a view for JWST

23 - 27 October 2017 @Oort

The purpose of the Lorentz workshop we organized was to bring together leading researchers working on diverse spectroscopic observations of galaxies across cosmic time to engage in a lively discussion about future scientific possibilities with JWST. We encouraged participants to

- consider how the wide spectral range and sensitivity available to JWST instruments will enable observational programs not thought feasible to the present;
- brainstorm about what exciting new science can be done by combining the diverse set of spectral lines and features in the rest-frame UV with those available in the rest-frame optical.

We had the following four goals for our workshop:

- it would result in new scientific results/papers based on new collaborations between scientists working in different observational domains,
- it would result in telescope proposals, both for JWST as well as existing facilities, based on collaborations between scientists working in different observational domains,
- it would result in new insights by all participants based on the diverse set of observations discussed around a single theme,
- it would improve the networking and project possibilities for scientists working in the Dutch community.

Thanks to the excellent set of assembled participants, our Lorentz Center coordinator, and high interest in the science topic of the workshop, our workshop ran very smoothly overall. The quality of the review talks and plenary discussion sections was extremely high overall, and the level of science interest is well described by this quote from one member of the SOC: "I plan to have a "conference-free" year next year, but will make an exception for this one!"
While the talks were excellent, a major focus of our workshop was on various breakout discussion sessions centered on scientific questions or proposal ideas that could be pursued with the James Webb Space Telescope, including measuring the stellar and dynamical masses of galaxies in the distant universe, probing star formation and feedback in young galaxies, obtaining observations to improve theoretical models, and refining our understanding the role and contribution of dust and AGN to early star-forming galaxies.

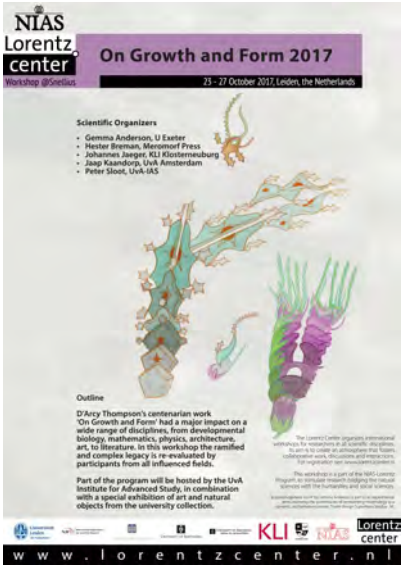
These discussion sessions included anywhere from 4 to 20 people and were often spread over multiple days to allow ideas and proposal plans to be fleshed out into a more sophisticated form. We were very pleased that as a result of the productive science discussions and dialogue, several very realistic proposal plans emerged. One or two proposal were sufficiently well developed, as to have already run most of the relevant exposure time calculations and include a significant set of co-investigators. As these proposals and a few more seem certain to be submitted and many of the individuals collaborating on specific proposal ideas had not previously been collaborators (with Dutch scientists on several key proposals), our primary goals for the workshop were accomplished.
To transmit back the main points of each break-out discussion session to full set of participants at our meeting and to facilitate the movement of participants amongst discussion groups, each morning

session at our meeting started with a summary of the discussions and issues raised in each of the breakout discussion groups. We found that this worked very well and made the entire meeting feel more cohesive.

Rychard Bouwens (Leiden, The Netherlands)
Stephane Charlot (Paris, France)
Richard Ellis (London, United Kingdom)
Lisa Kewley (Canberra, Australia)
Michael Maseda (Leiden, the Netherlands)
Alice Shapley (Los Angeles, CA, United States)
Steve Wilkins (Sussex, United Kingdom)

On Growth and Form 2017

23 - 27 October 2017 @Snellius



The aim of our workshop was to reassess the intellectual legacy in arts and science of D'Arcy Thompson's (DWT) classic book "On Growth and Form" published 100 years ago this year. In addition, we sought to bring together researchers and artists to kindle new collaborations to carry DWT's transdisciplinary approach into the future. We discussed five general topics.

"On Growth and Form" marks the beginning of mathematical biology and the mathematical study of organic form. Several participants, including Jarron, Budd, and Jaeger, traced DWT's legacy through several strands - such as paleobiology, morphospaces, process structuralism, and Turing theory - to modern biology (topic 1). Even though genetics and molecular biology have temporarily obscured this structuralist legacy, it has been gaining ground again over the last two decades.

Topic 2 concerns the link between genetics and mechanics, necessary to reunite DWT's approach with more mainstream ways of doing biology today. Phukhlyakova presented her empirical work on a gene whose regulation is sensitive to mechanical pressure. Among other presenters, Ball argued that pattern generators such as Turing systems provide the palette (the variability and novelty) from which evolution by natural selection can draw.

Topic 3 addressed whether current mathematical frameworks are sufficient for a theory of biological form. Goriely showed that DWT was not creating new mathematics, but was applying known tools to new problems. One prominent branch of mathematics that was missing from DWT's work is dynamical systems theory. Monk and Douady showed how it can be used to capture the dynamic geometry of growth and pattern-forming processes. Kaandorp and Chaplain examined the dynamics of branching processes. Grieneisen, Maree, and Carter presented their work on the mechanical properties of plant cells and the influence of tissue context on their growth and form. Chaplain showed how such insights can be applied to medical research, while Grieneisen uses swarm robots to mimic cell communication. Finally, architect Weinstock and physicist Doady are applying mathematical models to the growth of cities, an important growth problem that reaches beyond the scope of modern biology.

Topic 4 concerns the connection between art and science. Anderson, together with Budd, Maree and Grieneisen, argues that drawing is an important way of knowing, of gainining new insight. To let participants experience this first-hand, Anderson led an "isomorphogenesis" drawing workshop, which resulted in teamwork between artists, scientists and participants from other fields. Levy reviewed her own work and that of others incorporating scientific ideas into modern visual and performance art. Lee Chichester mentioned that influence of DWT on recent artists might be caused by the "New Materialism" movement. Randall-Page talked about the balanced interplay of randomness and patterning. Juler examine the influence of DWT on avant gard artwork in Britain.

Topic 5 examined the difficult problem of transdisciplinarity. Spotting increasing specialization within fields in modern art and science, Jaeger asked whether we all should be natural philosophers again. Participants concluded that even though specialization is currently required, there is also a strong need to bridge different fields, not just within science, but also including art, policy-making and philosophy.

Finally, there are several directions in the integrative legacy of D'Arcy Thompson, that can be identified. At first, although not present in "On Growth and Form", but in other work by DWT, the relevance of "play" was recognised by Jarron as well as Randall-Page. Second, DWT was also heavily engaged in conservation work (fisheries and fur seals), a connection which is continued by Kaandorp, whose work on corals is vitally important for learning about optimal conditions for the coral reefs that are currently

under threat. Third, DWT had many contacts with artists and he was an avid collector of art; Anderson shows in her work how art can be used in science and science education/outreach (STEAM).

One of the concrete results of the workshop is that two participants plan to collaborate on a grant proposal (FET Open) about biomineralisation in corals (Kaandorp) and diatoms (Douady).

In collaboration with the Institute for Advanced Studies in Amsterdam and the "bijzondere collecties" of the University of Amsterdam a special art exhibition (work by Anderson) and natural objects from the University of Amsterdam collection, all related to work by DWT was organized at the University Museum. The exhibition opened on Wednesday evening during the workshop and will be available to the public until January 2018.
We intend to publish a special issue of an interdisciplinary journal with work by workshop participants.

In light of the above, the organizers are very happy and satisfied with the outcome of the workshop, and thank the Lorentz Center in Leiden and the Institute for Advanced Study in Amsterdam for hosting and facilitating this event.

Gemma Anderson (Exeter, United Kingdom)
Hester Breman (London, United Kingdom)
Johannes Jaeger (Dresden, Germany)
Jaap Kaandorp (Amsterdam, The Netherlands)
Peter Sloot (Amsterdam, The Netherlands)

DNA Damage and Repair

Computations Meet Experiments

30 October - 3 November 2017 @Oort

The objective of the workshop was to bring together scientists working on DNA lesions and repair phenomena, coming from both experimental and modeling, as well as from chemical and biological fields have been perfectly achieved.

The main question the workshop intended to answer was related to the possibility of giving a comprehensive and multiscale description of DNA lesion and its repair in order to achieve the full understanding of a fundamental biological process related to ageing and the development of deleterious diseases such as cancer. Furthermore, the exploitation of such a knowledge in order to rationally design and develop novel therapeutic strategies has been stressed. In particular the workshop has allowed a deep survey of the state of the art and of the cutting-edge development in the field of detection of DNA oxidative and photo-induced lesions, as well as their biological consequences. The outcome of DNA lesions and their interaction with DNA repair enzymes has also been addressed both focusing on their molecular bases and on the complex interplay with regulative pathways.

Noncoding and regulatory DNA regions, such as G-quadruplexes (G4), have also been deeply analyzed, including their interaction with proteins and the possibility to target G4 in anticancer therapies. On a more fundamental level, molecular modeling methods allowing to achieve a deep understanding of the subtle electronic structure of complex DNA arrangements, and of their cooperativity, have also been presented and discussed.
One of the most important aspects stressed out during the workshop has indeed been the urge of a community building allowing to federate the efforts of the scientists working in the field of DNA damages and repair. In particular, merging the competences and the expertise of scientists coming from different background in order to achieve a global picture.

The federative issue has been agreed by all the participants and will be concretized in the following steps. First the publication of a common website highlighting the recent breakthrough in the field and allowing an easy exchange of information between the participants and also a considerable outreach activity towards stakeholders and general public. The website will also provide a common base to allow the deposit and sharing of computational and experimental results, such as force fields and structural data allowing an efficiency benchmarking and the development of a database available to the scientific community.

On a more formal way the participants have agreed to submit an application for a COST Action in order to access recognition and funding at the Europa level for the community. Finally, it has been decided that the workshop will be renewed in two years with a new edition that will take place in Valencia, Spain.

The workshop profited of the exceptional facilities of the Lorentz center allowing a deep and fruitful discussion between all the participants crossing the borders between scientific disciplines. This aspect was also facilitated by the format chosen that allowed a large space for round table and discussion on the topics previously highlighted by the lectures. This format, with the presence of rather restricted discussion groups, has allowed a deep participation raising interesting questions, such as the universality of the force field and the need of benchmarking, and has also allowed interesting exchanges between the more senior and early stage researchers.

Célia Fonseca Guerra (Leiden, The Netherlands)
Elise Dumont (Lyon, France)
Filip Lankaš (Prague, Czech Republic)
Antonio Monari (Vandeouvre-lès-Nancy, France)
Jean-Luc Ravanat (Grenoble, France)

Collecting, annotating, and analyzing video data

30 October - 3 November 2017 @Snellius

Aims of the workshop

From October 30 until November 3rd, 2017, Tessa van Charldorp (UU), Tom Koole (RUG) and Wyke Stommel (RU) brought together researchers from different disciplines (sign language, conversation analysis, health communication, first language acquisition, language technology, computer vision) and developers to discuss the future development of a sustainable Advanced Video Annotation and Analysis Tool called ADVANT. The KNAW (Royal Dutch Academy of Sciences) has recently put this tool on the Dutch national scientific agenda for large research facilities as one of the facilities that should be in place in the Netherlands in 2025. Our main question concerned how all participants can find common language and common ground and share their wish lists for the perfect tool of the future.

The workshop from Monday till Friday

On Monday the researchers presented their needs for video annotation and analysis tools from their various perspectives: from a sign language researcher (Onno Crasborn) who spends 250 minutes transcribing and annotating one minute of sign language interaction who wants to automate this process to a conversation analyst (Christian Heath) who needs ways of more accurately analyzing and visually representing the handover of surgical instruments.

Tuesday was the day of the developers. They shared their knowledge of how tools such as ELAN (Han Sloetjes) and speech recognition programs (Arjan van Hessen) were developed over time. The developers reflected on the various "wish lists" that were expressed from the various disciplines and methodologies represented at the workshop, including a secure pipeline for working with privacy sensitive video data. We concluded that a lot of features and functionalities exist in various programs but are not compatible with each other. A need for a modular system was established, both web and desktop based, that allows for flexibility and is secure at the same time.

On Wednesday, Julia Noordegraaf presented the already existing CLARIAH infrastructure and the Media Suite possibilities in which some of the ADVANT applications may find its future - depending on funding. We learned insightful lessons from similar German initiatives at the Institut für Deutsche Sprache from Thomas Schmidt and thought about the unique features that will make the new ADVANT tool flexible, sustainable and safe.

On Thursday we visualized the road towards having the tool developed: what societal impact will this tool have, what research questions does it help to answer, what collaborations are required and what is our timeline? The input from the previous three days came together in poster presentations, visualizations and presentations. On Friday, a small group of workshop participants started to turn all the ideas, lessons and insights from the entire week into products and started writing the beginnings of a proposal for funding.

Format feedback

The format of the workshop worked very well for our needs. We had short pitches, longer keynote talks, and presentations. We often set out in different groups and presented the results on posters, in presentations or on the walls. The space allowed us to move around freely and always be in contact with each other. We had one brainstorm session altogether in the coffee area where we used the bar table to draw out a roadmap. People were able to walk around the table - which led to inspiring thoughts and ideas. In retrospect, we feel that we could sometimes have benefitted from an external session leader. Someone who is not involved in the topic and who has experience in leading creative brainstorm sessions might have streamlined the discussions more (avoiding redundancy) and inspired us even further to think outside of the box.

Antal van den Bosch (Nijmegen, The Netherlands)
Tessa van Charldorp (Utrecht, The Netherlands)
Sandra van Dulmen (Utrecht, The Netherlands)
Tom Koole (Groningen, The Netherlands)
Wyke Stommel (Nijmegen, The Netherlands)

The Physics of Quenching Massive Galaxies at High Redshift

6 - 10 November 2017 @Oort

Descriptions and Aims

The subject of the workshop was to review the long-standing question of what shuts off star formation in massive galaxies, a phenomenon called "galaxy quenching". The scientific aim was to define the most pressing and important questions to distinguish between different hypotheses on quenching. Our goal as organizers for the workshop was to gather and promote collaboration among observers and theorists from various sub-fields including stellar populations, interstellar medium, and active galactic nuclei.

Format

Everyone was given an opportunity to present their work in a talk of at least 15 minutes. The talks were interspersed with discussions of different formats, including plenary and group discussions. The program was split into roughly 40% discussion and 60% talks (including questions; actual time devoted to talks was therefore less than 50%). Furthermore, talk sessions were never longer than 70 minutes, and ample time was reserved for coffee and lunch breaks. As a result, the workshop was characterized by a very high degree of interaction among the participants and a relaxed, informal atmosphere.

Before the workshop we asked the participants to fill out a short survey where they were asked "What questions do you wish to see addressed in the workshop?", "What do you think is the most controversial issue concerning galaxy quenching?", and so on. We presented the results in the opening talk of the workshop and used them to guide some of the discussion sessions. We also invited the participants to contribute further questions to feed the discussion sessions using Post-It's and the "Magic White Paper" that we hung on the blackboard.

One afternoon we broke down into 6 groups of 8 people at random, and asked each group to formulate an observational test of galaxy quenching. It gave participants the chance to meet and discuss with researchers from other sub-fields. On another occasion the groups were organized by topics, which were proposed and voted for by the participants. On the last day, we invited five senior researchers to provide their view on the most pressing questions regarding a topic of their expertise. All of the discussion sessions were well-received and interactive, and we recommend this format to be used more often in academic workshops.

Scientific Developments and Aha-insights

- During the group activity participants came up with observations which would be helpful for studying quenching, e.g. getting better age estimates of quenching galaxies using the far-UV, and getting strong upper limits on the gas mass of high redshift quiescent galaxies, hot gas observations of halos of quiescent galaxies, etc.
- While many quenching mechanisms are in circulation, there is no clear observational discriminant thus far to distinguish them.
- Molecular gas observations for quiescent galaxies are becoming available, but none of the quenching mechanisms so far can make predictions about this.

- The terminology of quenching is confusing and inconsistent. Many expressions (such as morphological quenching, environmental quenching, halo quenching) are used to indicate completely different mechanisms by people in different fields.
- Perhaps the most important result of this workshop was the realization that we are still very far from reaching a consensus view of galaxy quenching. Theorists and observers were equally surprised to realize that no consistent scenario has emerged yet; furthermore the very definition of quenching is still a matter of debate.

The workshop was well-received by many participants. Many participants expressed that they learnt a lot from colleagues who work in different sub-fields. They also appreciated the open, respectful and informal atmosphere throughout the workshop. Among the 63% of the participants who completed the post-workshop survey, a vast majority gave the top rankings to the scientific value of the workshop, the quality of the discussions, and the extent of inspiration to the research. Several participants expressed that it was the best astronomy conference they have been to, and the organizers were asked multiple times if a similar workshop will be organized again.

The Lorentz Center provided an ideal venue and the administrative support for this workshop. The offices, the coffee room, and the blackboards around the center provide suitable venues for informal interactions.

Sirio Belli (Garching bei München, Germany)
Ivo Labbé (Garching bei München, the Netherlands)
Allison Man (Garching bei München, Germany)
Thorsten Naab (Garching bei München, Germany)
Kate Rowlands (Baltimore, MD, United States)

Dark energy in the laboratory

13 - 17 November 2017 @Oort

Since in 1998 it was discovered that our universe expands at an accelerated rate, dark energy has evolved from a niche subject of cosmology to a focus topic of many related fields. Several theories have been devised to unravel the mystery of what the physical mechanisms behind dark energy could be, some of which yield testable predictions. Over the past decade, finally, numerous experiments were realized with the aim to tighten the present limits on the free parameters of these theories. The possible coupling of hypothetical scalar particles to photons has been tested in the GAMMEV/CHASE afterglow experiments and in CAST at CERN. More general interactions have been probed recently by oscillations of a Rb-Bose-Einstein condensate, neutron interferometry, bouncing neutrons, micro-spheres, Casimir measurements, and interferometry with Cs atoms, the latter giving the presently tightest bounds on parameters of some hypothetical theories. Many more ground and space based experiments are under construction and will be operational soon, giving hope to finally exclude some theories or find evidence for the actual mechanisms behind dark energy. However, we are not there yet. The dark energy in the laboratory workshop aims to reconcile the present status of experimental evidence regarding dark energy, discuss resulting limits on various theoretical approaches, and spur new ideas to explain the accelerated expansion of our universe.

One of the most important goals of the workshop was to bring together researchers from similar but distinct fields in order to learn from each other, foster new relations and collaborations. This goal was entirely fulfilled, as already during the workshop experimentalists began reinterpreting their data in the light of various theoretical models they became aware of. Similarly, the numerous moderated and non-moderated discussions have lead to a common ground of understanding of the theoretical side of dark energy models, both the modified gravity approach and screened scalar interactions. The consensus is that most models are actually either ruled out already as a realistic explanation for dark energy or will be tested exhaustively very soon. Numerous ideas have been brought up on how to move on and what else to try to explain the observed accelerated expansion of the universe. However, significant theoretical work will be necessary to evaluate these approaches thoroughly. Presently, there seems to exist no single candidate theory to explain the observed effects in a fundamental and satisfactory way.

For the community of dark energy physics, this workshop has certainly enabled a consolidation of recent efforts, a re-orientation, and an indication of what to try and what not to try to push forward the quest for a solution to the dark energy conundrum. However, despite the general motivation and high spirit, the present phase of scientific progress is a difficult one. Thus, being all on the same page now, the community can move forward and focus on new approaches. A new cycle of developments can be started.

Another goal of the workshop was to find a common ground in organizing meetings and scientific visits more frequently. While the proposal to apply for a COST action grant was refuted with the reasoning that the community is too small to find the required amount of participating groups (altogether, 15 nations need to be represented during the initial phase, an 26 for the complete network). A few alternatives have been discussed on how to organize workshops similar to the present one on a yearly basis. A committee to lead this action has been formed, comprising of Anne Davis, Clare Burrage, Babette Döbrich, and Ricardo Decca, who took the lead in preparing an application for a workshop at the Gutenberg University Mainz, which offers a similar infrastructure than the Lorentz center.

A point that became clear to me during the workshop was that researchers from related fields often face similar challenges without noticing that their peers may have an applicable solution. Bringing together people from such fields results in synergy effects and new ideas. This effect applies to both experimentalists and theoreticians and is highly appreciated.

I have heard from others and experienced myself several times that the general way in which Lorentz workshops are organized, with a rather loose program, ample time for breaks and discussions, and the spacious offices and facilities motivates people to immediately get to work with their new ideas, and to discuss problems in more detail and privacy than would be possible on a regular conference. In this sense, It seems that Lorentz workshops can potentially generate breakthroughs and have a large added value for a community, as such an intense interaction would not be possible in a different setting.

While for the dark energy community, no immediate breakthrough has been achieved, the resume is clearly positive in the sense that a common consensus could be formed on the status of theoretical work, and new scientific relations that may lead to future collaboration were formed. The community has grown and is synchronized and organized now, ready to implement and test new ideas regarding dark energy - thanks to the Lorentz workshop.

Philippe Brax (Gif-sur-Yvette, France)
Philipp Haslinger (Berkeley, USA)
René Sedmik (Amsterdam, The Netherlands)

Uncertainty Guidances in Science and Public Policy

13 - 17 November 2017 @Snellius

Science

This workshop brought together natural scientists, social scientists and philosophers - as well as practitioners who use scientific information to tackle real-world problems - to discuss how uncertainties in science can best be communicated both among scientists and to public decision-makers.

The workshop reviewed Uncertainty Guidances for treating uncertainties in science and public policy, and their practices of use. We discussed principles for the responsible use, provision and design of scientific information - in particular on climate change - for policy use and decision-making. Important questions were tackled on how to deal with expert judgment and model probabilities.

Besides having formed a new network of individuals that would like to continue to interact (and that will be expanded with people who couldn't make it to the workshop), the workshop outcomes include a set of Lorentz Principles that will be publicized and research and editorial articles that will be linked to these principles. An LSE-UCL web page will be used to do this. Also, the organizers will pay a visit to the leadership of the climate science working group of the Intergovernmental Panel on Climate Change (IPCC), to advise them on how to best proceed in dealing with uncertainty.

An interesting result of the workshop was that while we came from different disciplines and topical backgrounds (even though there was a bias towards critical evaluation of climate models), we independently came up with similar proposals for statements to be included among the Lorentz Principles while we hadn't decided to have a consensus around these. We had a diverse group of people who contributed what they thought was relevant, and then there clearly emerged agreement, at least on the themes (the specific wordings differed). A main example was the use of 'downscaled' climate information: this should always be explicitly justified following expert guidelines.

Organization/Format

We were able to have a high level of participation by not programming too many too long presentations. Only a few presentations were pre-programmed and all participants received the opportunity on the first day of the workshop to very briefly present their interests and potential contributions. What also worked well was to have participants submit text overnight (Thursday to Friday) for inclusion among the Lorentz Principles.

Furthermore, there was a very active sharing of presentations and papers via a joint Dropbox folder that we set up for the workshop. On the whole, we had a sufficient number of moments to collectively take stock and fine tune the program so that we would ensure to reach an optimal outcome. So the risk that we took (of not knowing exactly beforehand what we would be doing) paid off.

Jeffrey Anderson (University Corporation For Atmospheric Research, United States)
Nigel Harvey (University College London, United Kingdom)
Arthur Petersen (University College London - STEaPP, United Kingdom)
Leonard Smith (The London School of Economics, United Kingdom)
Erica Thompson (The London School of Economics, United Kingdom)

Physics with Industry

From looking through metal to travel time accuracy

20 - 24 November 2017 @Oort

In the eight edition of the Physics with Industry workshop, 35 researchers worked on five real-world industrial problems during five consecutive days. Shell, Boskalis, Sioux-CCM, Koppert and the National Data Warehouse for Traffic Information (NDW) participated with an industrial case.

The cases were selected by a scientific committee after an open call during which companies could submit a case. The submitted cases ranged from optimizing existing technology to getting a better prediction model to finding new theoretical opportunities to tackle a company problem. All of the case owners were pleased with the results of the week and participating in the workshop helped them to develop their case further.

For example Hans Kuppens on the case of Sioux-CCM: *"They have, in just one short week, been able to come up with two cost-effective solutions. Through a simple experimental setup and systematic approach they have uncovered the problem of the diffractive optical element and found a SLD on their own initiative. In one word: fantastic! We can now move forward with the presented solutions."*

All of the cases were coached by an academic and an industrial supervisor. This guaranteed the scientific quality and the applicability of the solution. The participants enjoyed the workshop due to the scientific challenge but also through experiencing how industrial problems are solved and how companies work.

The winning team worked on the Boskalis case and excelled with their original experiment: with candles and two bowls of liquid and gel they tested the acoustical differences and viscosity. They researched echography, heat-transport, calculated the amplitude of lamb waves and microgravity. They managed to provide Boskalis with an advise for a concrete solution that could potentially be used by divers.

The workshop was held from 20 to 24 November 2017 at the Lorentz Center in Leiden, and included a site-visits on 17 November as part of the preparation for the workshop. The project is a joint collaboration between NWO and the Lorentz Center. The findings and suggested solutions will be published online by the end of January 2018.

Bram Borkent (Utrecht, The Netherlands)
Maria Sovago (Utrecht, The Netherlands)
Melvin Kasanrokijat (Utrecht, The Netherlands)
Jeroen van Houwelingen (Utrecht, The Netherlands)
Johan Withagen (Utrecht, The Netherlands)

The Quest for Multiple Supermassive Black Holes

A Multi-Messenger View

20 - 24 November 2017 @Snellius

This LC Snellius Workshop was dedicated to multi-messenger studies of multiple supermassive black hole systems (SMBHs), with an emphasis on the best strategies for detection applicable to the current and upcoming observatories. Its main goal was to establish the most effective ways to define, propose, observe, analyse and interpret a wealth of data collected on multiple SMBH systems. The final objective was to create samples encompassing the parameter space of all critical observables (luminosity, separation, host galaxy morphology, merging stage). The workshop brought together worldwide experts from both observational and theoretical points of view, and resulted in lots of discussion about theoretical modeling and data interpretation.

It became clear during the workshop that while there is a rich literature on the topic, *systematic* searches of binary/multiple SMBH, or studies of their candidate hosts are very rare. An additional issue within our broader community is that judging the reliability and/or the significance of an observational (or even a theoretical) result is often difficult because of our limited knowledge of the methodology used by groups working in different fields, and sometimes even the terminology is different. As a possible remedy -- and as a direct result of the workshop -- we decided to summarize the state of the art of the field in a review paper, to be completed by mid-2018. This review will also serve as a guidance to the community how to address the most important questions that came up during the week:

- how can we better support observations with simulations, by providing various types of directly measurable quantities
- how to find the missing population of 10-100 pc binary black holes, and what avenues shall we take to find a handle on observationally confirming the most compact (milli-pc separation) binary SMBH candidates, and
- how should we prepare for the advanced gravitational wave mission LISA, by finding a population of transient AGN that may be candidate counterparts to merging SMBH.

The format of the workshop, within which entire afternoons were reserved for in-depth discussions in small groups with randomly selected participants, was excellent for our goals. The last day was left free for working groups, to discuss observing proposal ideas and papers in preparation.

Tamara Bogdanovic (Atlanta, USA)
Alessandra De Rosa (Rome, Italy)
Bernd Husemann (Heidelberg, Germany)
Zsolt Paragi (Dwingeloo, The Netherlands)
Cristian Vignali (Bologna, Italy)

World Histories of Architecture

The Emergence of a New Genre in the Nineteenth Century

29 November - 1 December 2017 @Snellius

Description and aims of the workshop

The workshop studied the emergence of the first surveys of world history of architecture in the nineteenth century, with the aim to recover the reflections of the original authors on the advantages and limitations of the survey text, believing that their thoughts

- will put a new light on the origins of the genre
- are instructive for our current effort to question established canons and to write comprehensive global architectural histories, from a post-colonial perspective.

Nineteenth century authors touched upon tensions that are still relevant and debated today in the fields of (architectural) history and cultural heritage studies: tensions between a global versus national perspective, between general narratives versus local stories, between professional and popular/vernacular knowledge, between cultural transmission and indigineous phenomena.

Tangible outcome

The concrete aim of the workshop was twofold

- To publish the first comprehensive study on nineteenth-century world architectural histories.
- The book is well on its way, since we have discussed each other's draft chapters during the workshop (see 4). The book proposal is almost ready to send to a publisher, the final essays are due in April/May.
- To create a network where scholars on nineteenth century architectural historiography and today's scholars on world architectural history can exchange ideas and may develop new projects.
- The fact that these two different groups of scholars spent three days together, got to know each other and discussed each other's work, was very instructive for both of them (see 3). The workshop did not form the starting point of new collaborative projects so far, but it has altered the outline of our book, which will include more chapters on present day world architectural history writing (see 4). Petra Brouwer will initiate in june 2018, on the bi-annual meeting of the European Architectural History Network a formalized 'interest group' on the topic of world architectural history. It is expected that (almost) all participants of the workshop will join this interest group. Meanwhile, people have been invited already to other workshops/events, now that they got to know each other in person.

"Aha" moments

We definitely had the experience of bringing together different groups of scholars, who realized all the better what they had in common (eg the methodological and practical problems of giving an 'overview' of the world history of architecture) , but also what fundamental differences there were (eg: today's rejection of a grand narrative, or the different scholarly traditions in 19th century Germany and the anglo-american world.

Format of the workshop

What was completely new for all participants, was to discuss each others texts - instead of giving presentations. For the book to be more than an edited volume, we as organizers, deemed it essential to have already the draft essays there. Furthermore, we assigned two readers to every essay, to stimulate discussion. This was the best choice we could have made. It made very clear what were the good essays, what essays should cover, how they could be different from each other, and what was essential for all of them. It much deepened the discussions and increased each other's commitment to and involvement with the book. We ended every day with a lecture/comments of a scholar in today's architectural history writing. This was a good 'break', and the themes they addressed were so relevant that we decided to to include their contibutions in the book. What I would do a next time, is to include an extra day for just the three of us, as convenors. We now met a month later, in January, but to have an extra day to wrap up the discussion, to discuss how to move on etc. is very helpful and time-saving.

Other comments

The organizational support of the Lorentz Center has been outstanding. I felt supported all the time, I had my hands free so to say. I have heard many compliments from my colleagues about the smooth organization - at all levels (hotel, meals, facilities).The intake I had, to think through the aim and the format of the workshop, was the best I've had in my scientific career. I did not follow up on everything, but it's - unfortunately - very rare that somebody thinks things through in order to get the best out of it. Thank you for this experience! The only minor thing I found a bit time consuming and not very instructive, was to write a comment on the feedback from the NIAS-Lorentz advisory board questions.

Petra Brouwer (Amsterdam, the Netherlands)
Martin Bressani (Montreal, Canada)
Christopher Drew Armstrong (Pittsburgh, PA, United States)

Random Dynamical Systems

4 - 8 December 2017 @Oort

The study of nonlinear dynamical systems has been one of the success stories of mathematics and science in the 20th century. The implications of these studies have been instrumental to understand the behavior of complex systems. Increasingly, applied scientists have been taking noise into account into their models of science, engineering and medicine. The field of random dynamical systems addresses the description and understanding of the dynamical behavior of nonlinear dynamical systems driven by noise. Despite huge developments in stochastic analysis and their applications, the treatment of noise from a dynamical systems perspective lags behind current practice in applied modeling and simulations, resulting in an unwelcome gap between theory and practice. This workshop brings together mathematicians that are at the forefront of the research into random dynamical systems, representing a broad spectrum of points of view. The aim of the meeting is to shape a vision towards the further development of this important field and enable researchers with complementary expertise to meet, exchange ideas and seed collaborations.

The program contained a combination of a limited number of overview talks and shorter research talks. The program was concluded by a plenary discussion. We introduced some combined presentations, where longtime collaborators jointly spoke on the progress in their research. The schedule turned out to be very active in reaching our goals to have presentations of all important research directions but at the same time to keep ample time for informal discussion. A small and informal poster session, during the wine and cheese party, gave the opportunity to explain some results not presented in talks. Research on random dynamical systems varies from pure to applied, and from low dimensional to high dimensional models. Also the questions people focus on vary; they run from structure of attractors, changes in dynamics for instance through tipping points, ergodic properties involving time series, and statistics of extreme phenomena. All these aspects were covered in the workshop.

To give a non-exclusive summary, merely to indicate different of the covered topics:
Vorkastner, Scheutzow and Crauel discussed various aspects of random attractors, exploring the boundary of our knowledge. Studies in bifurcation theory were presented by Runo (with a novel approach to bifurcations) and Engel (with pertinent results in the hard problem of the random Hopf bifurcation). Further theoretical results were addressed in talks by Sumo (random complex dynamics), Berglund (random Poincaré maps), Newman, Colonius, Feng, Zhao, Kalle and others. The currently much debated extreme phenomena were presented in talks by Moreira de Freitas, Freitas, Vaienti. Higher dimensional random dynamics were the focus of several presentations, such as by Pereira (random networks) and by Bates, Pavliotis, Lu (random partial differential equations). Applications in meteorology and oceanography were central in presentations by Chekroun, Lucarini and Gonzales Tokman. The workshop was concluded with a presentation by Melbourne on the state of the art of approximating random dynamics by deterministic dynamics on different time scales, and a plenary discussion. The plenary discussion led to debate on how to best model noise.
The organizers and participants found the workshop very successful in bringing together different communities working on random dynamics, and in presenting and discussing its current results and future problems. Although this was a mathematical workshop and we took care of having presentations with an applied background, we found that a few more talks with an applied background might have been useful. We were pleased to see a substantial participation of younger participants, and visits of researchers from the Dutch scientific communities in dynamics and in stochastics, as well as from the parallel workshop in Snellius on Random Structures on the Brain.

We like to add that we were very pleased with the poster design of a random Lorentz attractor coming from a study in meteorology by Chekroun, nicely indicating a bridge between pure and applied research in random dynamics. All were very excited about the open research environment offered by the Lorentz center and its impeccable organization.

Jeroen Lamb (London, England)
Martin Rasmussen (London, England)
Ale Jan Homburg (Amsterdam, Netherlands)

Future and Emerging Mathematical Technologies in Europe

11 - 15 December 2017 @Oort

The workshop took place in the Lorentz Center on December 11-15, 2017. Unfortunately, due to extreme weather in Europe on December 10-12, several participants were not able to arrive to Leiden. Nevertheless, with a few minor adjustments the workshop had a full program as planned. Mathematicians from 15 European countries have participated in the workshop.

The primary objective of the meeting was to discuss success stories and share experience and best practices of organizing collaborative research projects with industry, as well as to discuss and brainstorm about joint future activities. One of the major obstacles we addressed is the low visibility of mathematical technologies in European programs. We had discussed at length the necessary measures to facilitate awareness about existing expertise in Europe and knowledge transfer.

On Wednesday afternoon, a special public session was held: four speakers from industry spoke about the mathematical challenges their facing.

Based on discussions during the workshop and the panel discussion on Wednesday afternoon, the following conclusions have been formulated:

- A complete industrial product or process in its whole life cycle can be accompanied by a virtual representation, often called digital twin that allows design optimization, process control, lifecycle management, predictive maintenance, risk analysis and many other features.
- In the present-day situation, digital twinning is probably the most promising framework for comprehensive utilization of mathematical technologies.

Success in the development of the digital twinning technologies depends crucially on collaboration between academia and industry. Moreover, a special attention should be paid to generations of new algorithms and concepts combined with a focus on usability and transfer.
It has been decided that a working group, formed during the workshop, will investigate specific research opportunities in this area.

Participants evaluated highly the scope, program and organization of the workshop. In the opinion of organizers and the participants, the workshop was a big success.

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Intersectionality and Algorithmic Discrimination

Intersecting Disciplinary Perspectives

18 - 22 December 2017 @Snellius

Description and aims

In the wake of the Big Data hype, a need has arisen for more realistic and critical analyses of the opportunities and risks associated with the widespread use of data analytics within society. Discrimination may emerge from the use of algorithmic systems due to historically biased data, societal biases and structural inequities, lack of knowledge about mechanisms of structural discrimination, all of which may creep into design choices when building large scale information systems.

Our workshop was born out of the need for reflection on the complexity of the intersecting power systems in society, how these are encoded in decision structures and how we should deal with this in the context of algorithmic systems. While intersectionality theory offers decades of scholarship on such questions, it has so far been disconnected from the debates on algorithmic discrimination. The main aim of our workshop was to initiate an international, multidisciplinary, diverse community to resolve this disconnect.

Program, preparations and how it unfolded

We were honored to have an introduction on intersectionality theory and an extensive Q&A from Prof. Philomena Essed, whose scholarship of decades spans both the Dutch and US debates. For representation of existing discussions in algorithmic discrimination, we relied on introductions from Prof. Solon Barocas, Prof. Krishna Gummadi, Prof. Anne Lauren Hoffmann, Prof. Scott Skinner-Thompson, as well as a video presentation from Prof. Michael Kearns.

While we deliberately chose for the small scale set-up of the Snellius facility of the Lorentz Center, we were well aware of the wide interest in the topic. For this reason we organized a public lecture at the (freshly renovated!) Boerhaave museum, with danah boyd of Data & Society speaking on Fairness and Accountability of Sociotechnical Algorithmic Systems. This lecture was very well attended by a diverse audience.

Throughout the organization phase of the workshop, a significant effort went into the curation of the content and participants of the group. The organizing committee collectively read and discussed texts to grasp the disconnect we intended to address. Based on this, we agreed that bridging across existing networks of researchers would not be enough; we wanted the conversation to be shaped by scholars who actively engage with marginalized and/or vulnerable communities, and weave that engagement into their academic practice. We balanced the participation to ensure that the experience and knowledge of these scholars would be equally represented and well received in the room.
While curating the workshop, we were also aware of the challenges put forward by differences in disciplinary power - manifest in funding, scientific standing and societal interest - methodologies, vocabularies, cultures, and personal experiences our participants would bring in relation to the subject matter. To address this, we chose working methods to create a space of openness and safety for everyone to feel welcome to lay their perspectives on the table.

Our methods included a set of principles for interaction, which we invited participants to commit to at the start of the week; assignment of a translator to each session that would mediate cross-disciplinary discussions; and, a reader with excerpts from seminal papers on the workshop theme from different

disciplinary perspectives that was distributed in advance. The central of role of translation became particularly clear in the session where Solon Barocas and Krishna Gummadi supported us in collectively stepping through Michael Kearns' video-presentation of his paper to collectively discuss the exact meaning of the results and provide background to them from all different disciplinary perspectives present in the room.

All in all, our participants were extremely engaged and invested in creating a mutual understanding of the issues at hand, recognizing significant differences among us, and finding constructive and coordinated ways for going forward. The interactions were intense and produced a lot of material and ideas for future research and collaborations. In anticipation of this intensity, we organized infrastructure to document all sessions by collaboratively taking notes in a shared etherpad-environment. For this we used the stand-alone infrastructure developed by the Belgian art collective Constant VZW.

Outcomes and take-aways

While the rich experience of the workshop requires time to fully digest, participants articulated both personal and shared initial take-aways in the closing session, such as: never overlook historical context when considering (algorithmic) discrimination; equal distribution of errors or unwanted consequences does not guarantee justice; there may be domains or cases where it is better not to deploy algorithmic systems at all; intersectional discrimination cannot be articulated as a function; and as a meta-insight on interdisciplinary work: concepts act as different methodological tools in different fields.

The processing of the event documentation is a first step towards the planned writing of a research strategy document. In the first couple of months after the workshop, the participants have already reconnected at several international venues (FAT* at NYU, CPDP in Brussels), and are working on proposals for follow-up workshops and joint papers based on the workshop discussions.

Other comments, suggestions and/or criticism for the Lorentz Center, the scientific advisory boards and/or future organizers

The mission statement of the Lorentz Center states that it "is committed to stimulate diversity in all aspects." Our workshop brought together scholars from well-funded and currently prominent fields (e.g., computer science, technology policy) with scholars whose work is key to the topics at hand, but whose fields are underfunded even within first-world universities (e.g., humanities, intersectional studies). This discrepancy is likely to intensify as more public and private funding flows to STEM fields. We would encourage the Lorentz Center to explicitly consider diversity along such axes as well in their offering of financial support.

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Design

SuperNova Studios, Amsterdam

The Lorentz Center organizes international workshops in all scientific disciplines. We believe that research thrives by open interaction. We promote innovative research, at the scientific frontiers as well as on complex societal challenges. Our strength is to foster collaboration between research communities, reaching also beyond academia. Our workshops are characterized by ample time for active discussions and informal interactions.

'You do the research, we do the rest'

Universiteit Leiden
The Netherlands

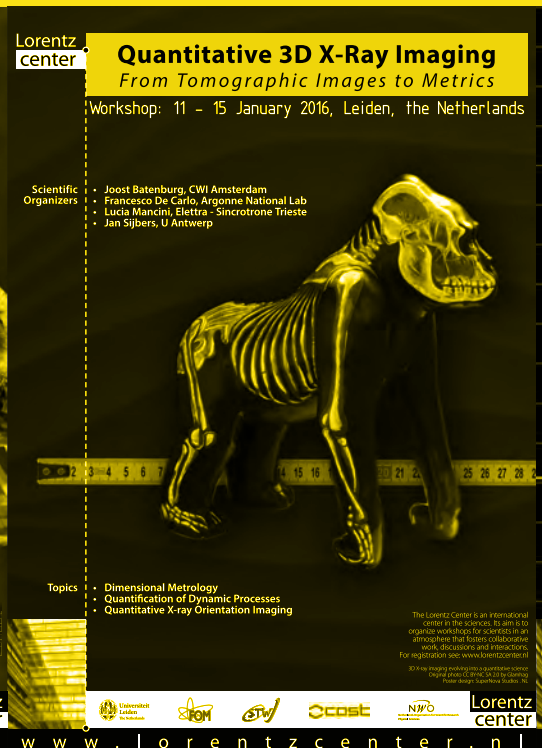
NWO Netherlands Organisation for Scientific Research

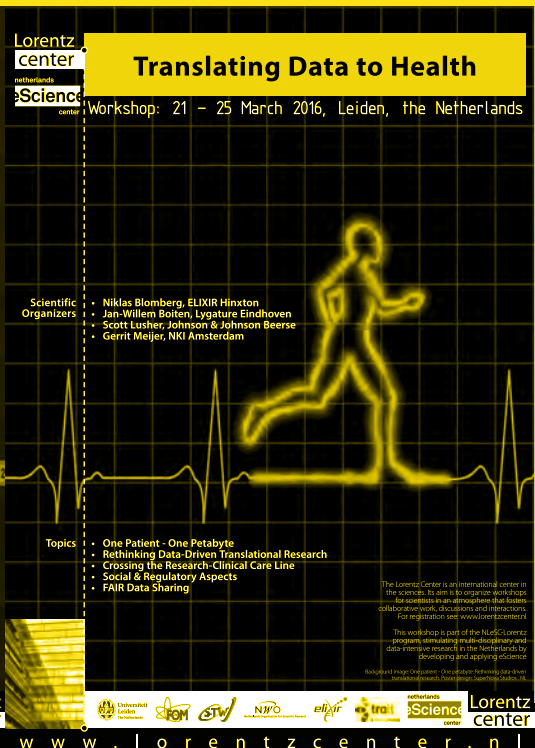
NIAS

cecam Centre Européen de Calcul Atomique et Moléculaire

netherlands eScience center

rijksmuseum boerhaave





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