Lorentz Center
Scientific Reports
2020-2021

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2020-2021

// Appendix to the Annual Report

CONTENTS

Extreme Physics, Extreme Data

13 - 17 January 2020 @Oort

The workshop focussed on the emerging field of applying modern machine learning and data science methods to "extreme" plasma physics; the physics of matter at extreme densities and pressures. Such conditions can be created in the laboratory on Earth using high-powered lasers, but can also be found in astrophysics. Understanding these conditions potentially paves the pathway to nuclear fusion as an industrial power source, as well as helping improve our understanding of the Universe. Extreme plasma physics experiments historically had a very low data rate, but future planned laser facilities will have a very high shot rate, with the potential to produce huge amounts of data – moving the field into the Big Data regime and creating a corresponding need to leverage modern data science methods

Topics presented in 23 scientific talks at the meeting included: machine learning for both inertial and magnetic confinement fusion, data science for space weather, statistical analysis of laser based particle physics experiments, machine learning pipelines and big data tools, optimisation of free electron laser experiments, coping with data from high repetition rate laboratory astrophysics experiments and data mining cosmic ray detectors. In a series of discussion sessions we discussed what algorithms were most appropriate for different scenarios, what algorithms the community might need in the future, what data standards should be used in the field, and what the future of exascale computing might hold.

Attendees came from a range of backgrounds from nine countries, and from a mix of universities, national laboratories, industry and government. Attendees were predominantly PhD students or early career researchers. The meeting had a range of different levels of machine learning expertise, from experts, to those no with no experience in the area, but with interest in using it in their research in future. It bought together researchers with similar research problems in plasma physics, but working in a wide range of contexts (e.g. astrophysics versus nuclear fusion). Representatives from the high energy physics community were also kind enough to attend and share their experience of meeting Big Data challenges.

A key goal of the meeting was to write a white paper detailing the conclusions of the meeting; what standards the community should adopt, what machine learning can do for the field and what the future may hold. Participants were very keen to contribute to this document, and for it to be published. Substantial progress in writing the white paper was made during the meeting and around 17 of the participants are now actively contributing to developing this document further. The organisers are in contact with editors to find an appropriate journal for the paper and we hope to submit it in the coming months. The resulting document will be circulated to key funding bodies and policy makers in research councils and national labs.

The meeting was very well received, both in terms of the scientific content of the meeting and the structure of the Lorentz Center, with comments including "Thank you very much for organising the meeting. It was great!", " a great meeting that I think will be seen I think as a watershed meeting in the subject", "Thanks for organizing this awesome workshop!", "Thanks for the organisation of an excellent and enjoyable workshop""A great week, and I got a lot from it" Although it is only a few weeks after the meeting there have already been a few follow up meetings, and one successful grant application linked to the meeting. There was a lot of interest in a future meeting and there is a provisional goal to aim for a follow up workshop in 2022 to discuss progress in the area. The organisers are very grateful to the Lorentz Center for supporting the meeting, helping in the development of the proposal, and for making the event a success during the week.

Peter Hatfield (University of Oxford, United Kingdom)
Gemma Anderson (Lawrence Livermore National Laboratory, USA)
Jim Gaffney (Lawrence Livermore National Laboratory, USA)

Dynamics of Dominance of Females Relative to Males in a Group

13 - 19 January 2020 @Snellius

The aim of the workshop has been to generate the latest insights into the determinants of inter-sexual dominance relations in animals and humans, and to set up a new scientific field of studying this. Major questions regarding intersexual dominance concerned its causes, benefits, and evolution. As to its causes the main questions were to what degree inter-sexual dominance relations in influenced by sexual dimorphism in body size, the self-reinforcing effects of winning and losing fights, agonistic (also called coercive) strategies, and prosocial strategies (such as grooming, coalition formation and strategies to gain a good reputation). Benefits of female dominance relative to males concern protection of females against males in terms of safety for their offspring, autonomous choice of mating partner, priority of access to food sources, and in humans also career opportunities and equity in payment. As to evolution of inter-sexual dominance, a particular focus concerned sexual control by males of females.

It became clear from the range of animal species (mostly primates) surveyed by the speakers, that the causes of inter-sexual dominance differed per taxon. Whereas in some species of, for instance baboons and the common chimpanzee, sexual coercion (helped by male biased sexual dimorphism in body size) keeps females completely subordinate to all males, in other species of baboons and the pygmy chimpanzee also the bonobo, females sometimes dominate males (a degree of co-dominance). In other taxa (such as macaques, vervet monkeys and capuchin monkeys), despite males being much larger in body size than females, males do not completely dominate all females. Instead, females are more dominant over males in those groups the higher the percentage of males in the group, probably due to the self-reinforcing effects of winning and losing fights. Effects of sexual dimorphism in body size on inter-sexual dominance relations were weak or absent among species of lemuridae and indriidae. In hyenas intersexual dominance depends on support and alliance formation. Further, in promoting women in leadership in humans, dominance may also derive from prestige and respect, and organizational norms and structures, instead of being only based on coercion. Our overview leads to evolutionary questions regarding what evolutionary trajectories led to all these different patterns.

The format of the workshop was praised by many of the participants. It consisted of about three key note lectures in the morning related to the main questions posed above and extensive topical discussions in self-selected sub groups in the afternoon. Discussions of sub-groups were fed back to a plenary meeting each afternoon while keeping track of the main points of discussion in the form of bullet lists. Topics involved, and were not confined to, pluriformity of causes of female dominance, methodological issues of dominance, confusion about jargon between scientist studying humans and those studying animals, absence or presence of behavioral differences between the sexes in humans. On Thursday, a number of participants chose to take some time off during the afternoon to tour the city of Leiden.

Tangible outcomes of the workshop were the creation of several collaborations, either setting up collaborative projects for Master Theses, collaborative papers, for instance on definitions and methods of measuring dominance, and exploring the possibility of a large communal grant proposal. To facilitate the continuation of the group's collaboration after the workshop, we have set up a shared Google Drive depository for the exchange of ideas and group-wide updates of manuscript drafts.

Joey Cheng (York, Canada)
Charlotte Hemelrijk (Groningen, the Netherlands)
Peter Kappeler (Goettingen, Germany)

ICT with Industry 2020

20 - 24 January 2020 @Oort
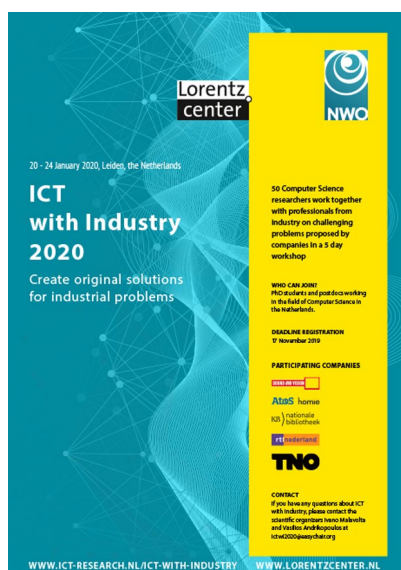
Under the umbrella of ICT-research Platform Netherlands (IPN) the workshop ICT with Industry was organized by NWO in collaboration with the research schools ASCI, IPA and SIKS.

Science

The workshop strives for direct and rapid interaction between ICT researchers and industrial partners with the following objectives:

- To stimulate contact between ICT research and industrial R&D.
- To obtain creative solutions for industrial problems and to find new approaches that could lead to such solutions.
- To give insight into the wide range of possibilities ICT research offers and thereby enable accelerated innovation.
- To enrich the PhD students' and postdocs' experience in collaborating with industry.

In this edition, five industry cases were explored by the academic teams. A total of over 40 participants from industry and academia were working on these cases, of which more than 30% female participants. The cases for this edition were data science-oriented and all of them resulted in promising methods and concrete directions to further develop. For future collaborations NWO provides several funding instruments, e.g. Perspectief, Take Off, etc. The teams were invited to present a demo or a poster at ICT. OPEN2020. KB and Sound and Vision have already shown an interest to present the outcome at ICT. OPEN. The academic team leader of RTL will hire master students to further explore the project and see if a funding proposal can be set up. Besides this short report, the Scientific Organizers together with the case teams develop a full report on the cases and the outcome. Please find below the outcome of the five cases.

Organization/Format

The format of the workshop was similar to previous editions. The daily presentations were limited to once a day, instead of two times. Also, the daily presentation on Thursday was cancelled, as this was followed too quickly by the Friday end presentations. This worked well. Other comments will follow in the evaluation/intake for the next ICT with Industry.

Outcome of cases

KB: Improving Acces to Early Modern Gothic Texts with NLP and Machine Learding (IMAGIN)
Participants: Lotte Wilms, Rutger van Koert, Lambert Schomaker (academic leader), Giovanni Colavizza, Koen Dercksen, Jerry Guo, Adrienne Mendrik, Xue Wang, Mahya Ameryan, Konstantin Todorov.

It has become clear that the part of the documented Dutch history which is printed in Dutch Gothic font, is not yet digitally accessible. Modern approaches of optical character recognition (OCR) still cannot handle this material appropriately (not even several well-known commercial companies). Our team addressed problems at four levels in the processing pipeline: Image preprocessing, Layout analysis, Recognition and Linguistic postprocessing. The team was not only able to develop concepts for an overall performance evaluation framework, but actually produced new code and trained deep-learning methods. End-to-end training of deep neural networks was possible in the four days, using CNNs for image processing and layout analysis, and an LSTM for the recognition process. For

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linguistic processing, a fine-tuned version of the 'BERT' model was realized. Additionally, tools were developed to use the recognition results of commercial companies on the 17th centure Newspapers (Meertens, Amsterdam) for in-house training of recognizers at the KB and the Huygens Institute.

RTL: Multimodal Emotion Recognition
Participants: Hendrik Vincent Koops, Daan Odijk (company representatives), Albert Ali Salah (academic leader), Arkajit Bhattacharya, Metehan Doyran, Cecilia Herrera, Kaya Heysem, Alexander Serebrenik, Joanna Strycharz, Yasemin Timar, Anja Volk, Osman Semih Kayhan.

Automatic analysis of video archives is a topic long-researched in multimedia. In this project, conducted with RTL Netherlands, we investigated methods for developing an integrated tool for analysis and visualization of the storyline in a TV series by combining a range of technologies in affective computing and multimedia analysis. The input to the proposed system is a set of episodes from a TV series, in proper temporal order, including subtitles. We analyse the input in
audio, video, and text modalities, and identify characters in each scene. We accumulate information about the interactions of the characters and create an interactive visualisation that helps visualizing the episodes of the series, as well as accessing specific information. Our results are potentially useful for creating a tool that will help directors in creating promotional material, for multimedia summarization, and for creating visual interfaces into multimodal archival material.
We also analyze the language of soap operas, how music and sound are used, and how different modalities are used to create certain affective results.

Sound and Vision: Scaping Generous Interfaces for Audiovisual Heritage Collections
Participants: Erwin Verbruggen (company representative), Roeland Ordelman (academic leader), Jia-Hong Huang, Nirmal Roy, Ioannis Petros Samiotis, Wei Zhang, Soroush Rasti, Nikhil Bhuwakar.

During ICT with Industry 2020, participants of the Sound and Vision use case explored strategies for finding relevant data collections that are not yet known to a professional user, such as a researcher or journalist, who is seeking information on a certain topic. To describe this process, we coined the term 'collection recommendation': given a journalist's need for information (query), which collections are most likely to help in answering it. Starting from the FAIR principles, the team developed a conceptual model for the stages in a collection recommendation system. The point of departure was our observation of a tendency for journalists to involve others in their quest for information, referred to as engaged journalism, open-source journalism, or citizen intelligence. This source of information was incorporated in our system using a crowdsourcing/niche-sourcing model. This model interacts with a multimedia collection miner and a collection analyser that extract useful information describing the collections. The analyser could use entity extraction techniques, potentially making it possible to interconnect data sources (linked journalism). Ultimately, the recommender engine in the last stages of the pipeline uses both crowdsourced and extracted information to recommend certain collections to the journalist. To produce a good recommendation, the recommender may use various techniques to improve the system's understanding of the information need of a user (e.g., relevance feedback, user profiling) and to perform relevant collection retrieval (e.g. diversification algorithms). On the basis of this collection recommendation model, the team listed a number of very interesting research questions on various levels. We are very positive about te prospect of using the model and questions to define the next research and development steps in the emerging field of data research and data journalism.

Atos | Homie: Wash program prediction
Participants: Jorrit De Vries (company representative), Kerstin Bunte (academic leader), Dolly Sapra, Liang Song, Michiel Straat, Annelieke van den Berg, Emma Gerritse.

Homie introduces the Pay-Per-Use model for whitegoods with the aim of reducing environmental impact of domestic appliances by steering users towards more energy-efficient behaviors and promoting product longevity. To facilitate the growth of the company and expansion beyond the domain of washing machines, Homie needs to be able to deduct user's program choices from energy consumption patterns. Our group analyzed the energy consumption of 64 wash programmes, focusing on the research question whether it is possible to identify the temperature setting from this time series

data. With supervised techniques we first examined the correlation between the number of timepoints when the signal has a certain height and the temperature of the washing program. Second, we considered classification using regression, k-nearest neighbor and shapelets (sub-sequences of the time series). Through unsupervised methods, we found that signals in the heating sequence are highly alike and can be extracted. Lastly our group focused on data visualization in the form of dashboarding and reporting. With the dashboard, we made it easier to see for Homie which washing programs are actually efficient, so they are able to adjust their pricing in a data driven manner. Reporting of user's energy consumption behavior may be a promising method for nudging users towards more energy efficient behaviors.

<u>TNO: Create Multi-Purpose Digital Twins for Industry that are a factor 1000 cheaper than current approaches</u>
Participants: Jeroen Broekhuijsen, Jacques Verriet (company representatives), Bayu Jayawardhana (academic leader), Sobhan Omranian khorasani , Baver Ozceylan, Maya Sappelli, Sai Prithvi Palakurthi, Danial Senejohnny, Laura Crowley, Wouter Van Dijk, Sil Spanjer.

TNO brought two cases of digital twins from industrial partners which are involved in the recent TTW Perspectief program on digital twinning. In the Tata Steel case, four participants worked on the analysis of process data from the Hisarna reactor which is a novel iron reduction process that can reduce CO_2 emissions and energy usage significantly. Based on the site visit of the process and with minimal understanding of the physical process, the participants have been able to propose important variables and predictive models that are useful for on-line monitoring and providing early warning on the potential instability in the reactor. In the second case for ASM PT, another four participants worked on enriching the dynamical model of two link mechanisms used in their wire-bonding machines. Based on the frequency response data, the participants tuned the model autonomously and performed sensitivity analysis to the results. The problem formulations and methods that are investigated in this workshop have been communicated back to the case owners and will be taken up further in the TTW program on digital twinning.

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Bridging Material Science and Interaction Design

20 - 24 January 2020 @Snellius

Introduction

Recently different researchers have begun to explore the possibility of developing materials and products, which tightly integrate sensing, actuation and computation, making it possible to change their shape, stiffness, or physical appearance in a fully programmable way. This research perspective holds the possibility to add unprecedented functionality to everyday objects, allowing them to adapt their physical appearance and properties and has been carried out both within material science and interaction design. Although material science and interaction design share the same goals, they approach it from different disciplinary backgrounds, with different motivations, and little references exist to the work carried out together. The aim of this workshop was to bridge these two separate multidisciplinary fields, to gain a better understanding of the impact these materials can have on a personal and societal level, as well as to inspire scientific research that connects more closely to future applications. Therefore, this workshop brought together a diverse group of people, both researchers and professionals, with backgrounds in: chemistry, mechanical engineering, computer science, physics, arts, industrial design and aerospace engineering.

Approach

The workshop started with an introduction into the diverse research interests of the participants (fig. 1). This was followed by speed dating sessions to connect material scientists with interaction designers. In these sessions participants generated ideas regarding how new material developments could be applied in novel applications, and how applications could benefit from new material developments. Ideas, cross-domain topics as well as differences between the disciplines were identified. During a workshop in the Fablab of Zoetermeer, interaction designers and material scientists worked together on physicalizing some of the generated ideas (fig. 2) including: mechanical behaviour of complex structures by building mechanical systems into materials; 4D textiles and weave structures with sections composed of responsive properties; organic materials addressing dynamic and tuneable foods as well as edible displays; new developments in haptics addressing micro-energy harvesting for tactile interfaces and texture-changing haptic tattoos; novel approaches to shape-change and actuation by 4D printing samples embedded with electronics; adaptive wearables with 3D scanned body parts; dynamic sensing of range of motion using e-textiles; and finally novel displays including rewritable electrochromic/photochromic tattoos. After identifying potential application domains, the workshop focused on identifying cross-disciplinary connections and means to bridge the gap through research and education.

Outcomes

First, connections between the two disciplines were identified (fig. 3) addressing types of materials (polymers and textiles), design approaches (ideation, coding and prototyping), structural properties (auxetics and meta-materials) production techniques (3D/4D printing and weaving), display information (shape-change and haptics) and scale (micro-architecture topology, wearables, displays and architecture). The overarching challenges to bridge the disciplines were identified as transparency regarding the sharing of knowledge, storytelling addressing potential futures, timing and synchronization between developments (e.g. with regards to TRL engagement level yielding a differences in optimal solution vs. early prototyping), and the language barrier between researchers in the two disciplines. Various solutions were discussed such as finding or creating common

events; enabling storytelling for all disciplines; experiential prototyping vs. in-depth knowledge of a technology; residencies in each other's departments; mapping of sub-communities to better understand the potential of collaboration and more project based approaches. In addition, the motivations for stronger collaboration between the disciplines were identified as the need for specific skills and knowledge; societal challenges that need to be solved; and the need to create transparency for the different disciplines to enable exchange of knowledge between them. Ideas that resulted on how to bridge the gap included offering trick boxes relating to the different disciplines. Material science would offer their expertise regarding molecules, processes, publications and interaction design would contribute design of applications and discussions with industry.

Conclusion

Through the workshop interaction designers realized that the ideas and future applications which they are thinking of and working on, are actually possible and being researched in material science. They learned about the science of materials and physical phenomena. On the other hand material scientists obtained a new perspective, and were particularly stimulated by the creativity and different ways of thinking of interaction designers. They appreciated how interaction designers consider the qualities of materials from a user experience perspective rather than a technical perspective, thereby adding context to technology developments. However, there are still many constraints before we can bridge the divide. While interaction design ends at the simulation, material science ends at demonstration of a technology, and it is difficult to find people and industry that see the value or are willing to take the challenge up further. Another challenge was that the more technical people had difficulties in connecting to the more open and subjective design approaches. Finally, user safety and sustainability were identified as aspects that need to be considered for the future. Overall, the workshop offered the start of something which could become a new field. We will continue to identify the structure of this field and clarify what interaction design can offer to the material science community and the other way around.

Organizers

Majken Rasmussen (Aarhus University, Department of Engineering, Aarhus, Denmark)
Isabel Qamar (Massachusetts Institute of Technology, Computer Science and Artificial Intelligence Laboratory, Bristol, UK)
Danqing Liu (Eindhoven University of Technology, Department of Chemical Engineering and Chemistry, Eindhoven, The Netherlands)
Nikolaus Correll (University of Colorado Boulder, Department of Computer Science, Colorado, USA)
Miguel Bruns (Eindhoven University of Technology, Department of Industrial Design, Eindhoven, The Netherlands)

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The Cosmic Web in the Local Universe

27 - 31 January 2020 @Oort

Description and aims

The purpose of the meeting was to gauge the status quo experts in observations, theory and analysis of what the local cosmic web looks like and how it has effected the formation of galaxies within it. We aimed to have groups working on reconstructions, groups working on observations, and groups working on theoretical and observational quantification of the cosmic web.

Tangible outcome

We had around 60 participants. The program comprise 42 talks and panel discussions every day. A number of new collaborations have been established. Papers are on their way with at least one (that we know of) submitted (Lee & Libeskind). Long term visits between various groups have been discussed and planned (but interrupted by the covid-19 crisis). One of our participants, Punya Ganeshaiah Veena, was invited to give the This Weeks Discoveries lunch lecture on Tuesday January 28 at the Faculty of Science of the Univ. Leiden.

Scientific breakthroughs

We had a number of breakthrough moments. For example, Bland-Hawthorn (Sydney) showed novel results on the detection of spin alignment flip in the GAMA survey based on IFU measurements of stellar kinematics. Neyrinck (Bilbao) made a theoretical argument that filaments should be spinning – a finding that has prompted observers (Tempel, Tartu) to search for such a signal. Ganeshaiah Veena discussed the first ever predictions from hydrodynamic simulations on the alignment of angular momentum with the cosmic web – the first such predictions on the non-linear acquisition of angular momentum by baryons. Sawala (Helsinki) showed a novel process by which constrained simulations can be used to produce large numbers of Local Groups .

Format of the workshop

We had a combination of 40 minute review talks, 20 minute result talks, and 10m min student talks. We also made time for panel discussions and debates in the afternoons. The panel discussion were a mix of "open" guided debates and presentations. Any one was welcome to participate. We tried to pair theorists with observers for each panel discussion to get both sides of a debate – for example combining Wojtek Hellwing (Warsaw) with Geraint Lewis (Sydney).

Noam Libeskind (Potsdam, Germany)
Rien van de Weijgaert (Groningen , the Netherlands)

SOC:
Joss Bland-Hawthorn (Sydney, Australia)
Helene Courtois (Lyon, France)
Florent Leclercq (London, UK)
Bridget Falck (JHU, Baltimore, USA)

Science Based Rules on Plastic

27 - 31 January 2020 @Snellius

Regulating plastic pollution: basic principles from a scientist's perspective

Plastic pollution is everywhere, in the environment but also quite recently in the media. The research into plastic pollution can be dated back to the 1970s, when plastic litter was first reported in the oceans. It took till the 2000s when research on plastic pollution accelerated into a high-priority research area in marine environment and biology. Plastic pollution is now a much-researched topic, though primarily in the field of biology, ecology, and marine sciences. Visible and invisible plastic pollution is widespread, from urban areas, rivers, and lakes, to remote zones, such as the Artic Sea and Antarctica. Microplastic particles are found in marine animals and fish. Very recently research has expanded into the human health area.

Plastics are typically organic polymers of high molecular mass, which often contain other substances. Most plastics are synthetic, most commonly derived from petrochemicals, but there is also an array of variants made from renewable materials, so-called plant-based plastics. Due to their low cost, ease of manufacture, versatility, and imperviousness to water, plastics are used in a multitude of products in industry and society. Its ability to guard against contamination makes plastic useful in sterile medical environments such as hospitals. Other key characteristics of plastics are a high strength-to-weight ratio, stiffness and toughness, ductility, corrosion resistance, bio-inertness, high thermal/electrical insulation, non-toxicity, and outstanding durability at a relatively low lifetime cost. Its success in industry and society combined with the persistence of plastic have resulted in plastic waste and pollution being widespread and ubiquitous in today's environment.

The plastic waste and pollution therefore has captured the attention of the public, governments, and industry around the world. Along with the search for solutions that can be scaled up, there is growing recognition that addressing the symptoms of this crisis through clean-ups is not enough. We need to move away from today's linear take-make-waste model and fundamentally rethink the way we design, use, and reuse plastics. A systemic shift tackling the root causes is required: a transition towards a circular economy for plastic, in which it never becomes waste or pollution. The discussion about the seriousness and extent of the plastic problem and the solutions that should be adopted is conducted by many different actors, all with their own interests and areas of expertise. Nevertheless, environmental regulation has a tendency to be science-based, which is also the approach of the EU, for example in the REACH regulation on chemicals. The availability of data is crucial in the legislative process and either the absence or abundance of certain data may affect the outcome of this process.

The aim of the workshop was to formulate principles and guidelines based on scientific evidence regarding plastic pollution. The workshop brought together biologists, ecotoxicologists, chemists, environmental scientists, legal scholars, and policymakers from Europe. They put their heads together at a five-day workshop at the Lorenz Center at Leiden University in the last week of January 2020. They discussed the plastic issue from a scientific perspective, focusing in particular on single-use plastic; microplastics; plastic as a chemical or hazardous substance, and as a waste component; producer responsibility and liability for plastic pollution, including life-cycle and circular economy policies; standard setting for monitoring and reporting of plastic pollution in marine, fresh and drinking water and waste water treatment.

The workshop has formulated nine principles for regulating, processing, and the use of plastic, which will be launched in the near future and distributed to policy makers at the national and international level.

Science based principles on plastic in the circular economy

`**Essential usage** and **circularity** are the foundation for using plastic in a sustainable way'
Plastic is used a lot by many stakeholders and plastic pollution is ubiquitous. Scientific research has been and should be the drive to develop policies. These principles have been drawn up by natural scientists and lawyers, considering the latest research on plastic, and are aimed to incorporate sustainability and safety in the plastic usage.

We call upon policy makers and legislators to take in account these plastic principles:

1. Develop and implement the concept of **essential use** of plastics, to minimize negative environmental and health impacts, and resource depletion.

2. Strive for **chemical simplicity**, in order to enable effective circularity as well as to minimize hazard impacts from plastics on human health and the environment.

3. Strive for **transparency in the plastic value chain**, to enhance the opportunities for safe production, use, consumption, and recycling of plastic products, and to enable hazard assessment of mixed additives to plastic materials in a circular economy.

4. Ensure **material integrity** in substances and products of plastic, with the aim of enhancing durability and of preventing emissions in both the use and disposal phase.

5. Acknowledge the **persistency** of plastic materials, including the fragmentation of plastics, and the need to prevent future increase of plastic pollution.

6. Achieve **systemic solutions**, while providing adequate safeguards for society and nature, in order to lower plastic usage resulting in reduced environmental and health impacts.

7. Act upon the **assessment of alternatives**, to avoid regrettable substitutions and minimize trade-offs in the production life cycle chain as well as pollution of other impacts to the environment.

8. Establish a coherent **monitoring framework**, to get grip on the presence, magnitude and nature of the plastic pollution and it's impacts in environmental compartments, as well as to monitor the plastic production, use and disposal chain allowing to set benchmarks and assess effectiveness of measures and policies.

9. Safeguard **knowledge-science based decision making**, to transparently enable dialogues, relate underlying assumptions to knowledge, prevent polarized debate and develop solutions that tackle the root of the problem.

Scott Cunningham (Delft, The Netherlands)
Madeleine Hosli (Leiden, The Netherlands)
Jaroslaw Kantorowicz (Leiden, The Netherlands)
Erik Voeten (Georgetown, United States)

Mixing in Porous Media

3 - 7 February 2020 @Oort
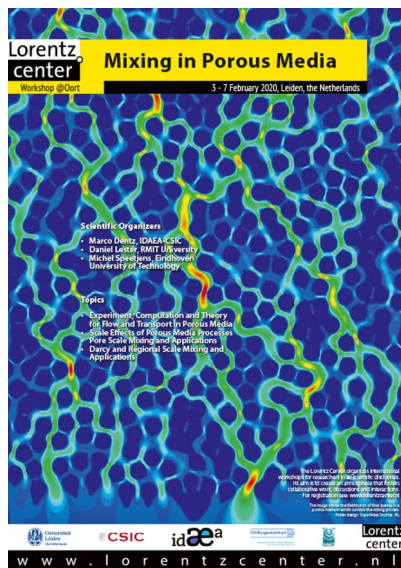
Description and aims

Mixing in porous and fractured media is key to a diversity of systems in biology, engineering and geology and span a wide range of spatio-temporal scales. Thus a deeper understanding of the mechanisms of mixing in porous media – including flow, transport, chemical reactions and biological activity – is essential for myriad applications. Insights into these mechanisms remain limited yet novel theoretical, numerical and experimental approaches in disciplines beyond those traditionally associated with transport in porous media have recently emerged that facilitate much deeper understanding. The aim of the workshop was bringing together scientists from relevant disciplines so as to (i) identify key challenges regarding mixing in porous media, (ii) develop strategies to address these challenges and (iii) develop strategies to strengthen and build a multi-disciplinary research community.

Tangible outcome

The following initiatives are taken so as to achieve a long-term impact beyond the workshop itself:

- A special issue on the workshop themes (with the workshop organizers as guest editors) in the Springer journal Transport in Porous Media (TIPM) with contributions by participants. TIPM features special issues on a regular basis and is an ideal "mouthpiece" into the porous-media community. The editor-in-chief, prof. Martin Blunt, supports this initiative. A call for contributions will be announced soon.

- Creation of a focus group "Mixing in Porous Media" in the International Society for Porous Media Interpore so as to structurally build a community for this topic. To this end the summaries of the "community-building sessions" (see workshop format below) are currently being combined into a "white paper" for the focus group by the discussion leaders and workshop organizers. Prof. Majid Hassanizadeh, managing director of Interpore (and one of the keynote speakers), supports this initiative.

- Creation of a dedicated website on the topic "Mixing in Porous Media" consisting of a theme-wise collection of the material presented at the workshop. To this end the presentation slides and posters are currently being collected by the organizers. This website will be made accessible to both the workshop participants and anyone else interested in the subject matter so as to maximise the outreach.

The organizers are, based on the lively discussions and significant audience participation during the workshop, confident that these initiatives will attract active contributions by many of the workshop participants.

Scientific breakthrough

The main goal of the workshop was contributing to the resolution of key challenges by bringing together researchers from different fields and foster multi-disciplinary collaborations. The workshop resulted in considerable exchange and interaction between participants from a wide range of backgrounds and thus achieved a (scientific) breakthrough in the sense of establishing new links between scientific communities and initiating post-workshop efforts as those mentioned above. This lays the foundation for scientific progress and breakthroughs on the key workshop themes.

Format of the workshop

The workshop was organized around a series of oral presentations punctuated by both informal and moderated discussions. Keynote lectures gave an overview of the state-of-the-art of the field and discuss open challenges. Invited and contributed talks as well as a poster exhibition for the duration of the workshop focused on current developments related with the workshop themes. Three so-called "community-building sessions", each moderated by 2 discussion leaders, were included to find common ground between participants for (cross-disciplinary) collaboration and concerted research efforts that address major challenges.

Marco Dentz (Barcelona, Spain)
Daniel Lester (Melbourne, Australia)
Michel Speetjens (Eindhoven, The Netherlands)

Individual Heterogeneity in Animal's Life Histories

More Than Meets the Eye

3 - 7 February 2020 @Snellius

Description and Aims

Individual variation is a building block for evolution, and it can also profoundly affect ecological responses: the average performance of all individuals in a population is typically different from the performance of a population of average individuals. In ecology, identifying life-history strategies is traditionally done by quantifying differences among individuals in observed traits (age, sex, size). Furthermore, comparative analyses have demonstrated the existence of a slow-fast continuum of life-history strategies across species. However, we may have only scratched the surface, as there is more to individual variation than meets the eye. Currently, we still have a limited understanding of how much unobserved heterogeneity occurs in populations, which patterns they exhibit, whether environmental variability affects these patterns, and thereby what their ecological implications are. Excitingly, recently important analytical advances have been made to quantify unobserved heterogeneity in demographic rates and how different demographic rates covary within a population. An outstanding question that remains to be answered is how diverse life-history strategies exists within species in general. To answer this, we have jointly analysed longitudinal data of a large set of species located along the slow-fast continuum. Accounting for both observed and unobserved individual heterogeneity using a common methodological framework, we are now unraveling systematic new patterns of life-histories within species that will transform or complement the current paradigm of life-histories.

Tangible outcome

So far, the workshop group (22 participants) has produced one collaborative scientific paper ("Fay et al., Quantifying fixed individual heterogeneity in vital rates", in review). Furthermore, there are two other follow-up publications in preparation (analysis phase). Finally, during the workshop we developed specific plans to organize a follow-up workshop in Canada (plans were put on hold due to the Covid outbreak going global directly after the workshop).

"Aha" moments

Our simulation study (in review) suggests that achieving our aims to analyses individual heterogeneity from long-term empirical datasets is very challenging, that we should expect intrinsic estimation bias from our models for such finite-sized datasets, and that these biases are likely to be related to the duration of the study and life-history of the study species. As this sets limits on what we can learn from even some of the longest-term studies in the wild globally, we have adopted our aims to reflect this complexity.

Organization/Format

Our program was a productive mixture of plenary lectures, discussion sessions and hands-on sessions to analyze the long-term dataset that people brought from their study system. We also left the program very open and adapted sessions according to the needs of the participants, which worked well. After plenary clustering of preliminary ideas, the participants organized themselves and set to work, with

a lot of exchange between groups. The open program encouraged participants to bring in their own ideas, and also for effective transfer knowledge among early-career and more senior scientists.

Organizers

Martijn van de Pol (NIOO-KNAW, the Netherlands)
Bernt-Erik Saether (CBD NTNU, Norway)
Stephanie Jenouvrier (Woods Hole Oceanographic Institution, USA)
Sandra Hamel (Université Laval, Canada)

Tackling the complexities of substellar atmospheres

10 - 14 February 2020 @Oort
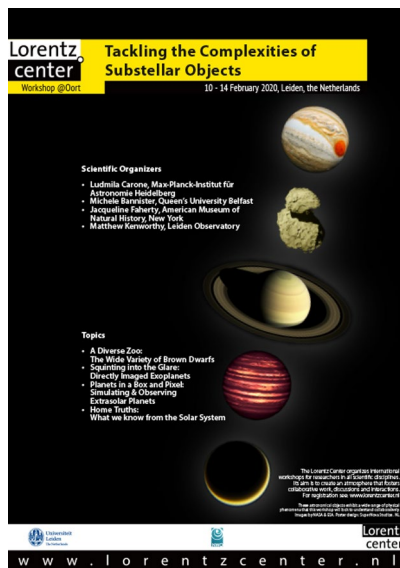
The **scientific goal** of this workshop was to bring together experts from four different sub- fields: in Solar System planets, the modeling and observation of transiting exoplanets, observation of directly imaged exoplanets and brown dwarfs. The idea was to formulate and discuss pressing problems and questions in the respective fields and propose methods and ideas on how to solve these issues.

Several major topics of interest emerged across the four different sub-disciplines:

- **Cloud modeling** proved to be of high interest as they appear in all substellar atmospheres, where different models and their benefits and drawbacks were presented and also offered to the community (e.g. VIRGA by N.E. Bathalha, M. Marley)
- the **role of retrieval**, that is, inferring basic (atmospheric) planetary properties like temperatures, surface gravity and molecular atmospheric make-up with simplified models based on (incomplete) observational data was discussed. Here, the participation of members of the brown dwarf and directly imaging exoplanets community and transiting exoplanet community proved to be vital. The former two had experience with the interpretation of very detailed spectra, whereas the latter had pioneered techniques to interpret even very limited data. It was generally agreed on that it would be highly desirable to apply exoplanet retrieval techniques also to brown dwarf data and those of directly imaged exoplanets: a) this could lead to improvements of derived parameters for brown dwarfs and directly imaged planets and b) exoplanet experts could test their methods on more detailed data before JWST data becomes available for transiting exoplanets. Furthermore, it was agreed upon that the simplicity of retrieval methods can lead to unphysical results. The only safeguard is to perform in addition to retrieval sanity checks with complex models that take into account a more complete physical picture.
- It came out that there are **difficulties to compare observationally derived data**, e.g. cloud composition and molecular composition across the four different fields. It was revealed that the different observation techniques but also intrinsically different temperature structures lead to different regions of the substellar atmosphere to be probed. Therefore, "temperature" in one case is not the same as "temperature" in the other.
- JWST was a major topic in the discussions, where we had the benefit to have several experts on site that led splinter session in how to plan observational proposals for their respective targets. Tools and resources were shared to facilitate proposal writing for JWST.
- Another topic of high interest was **variability** and their origin in substellar atmospheres: from the role of waves in the Solar System planets to observations of high variability in young brown dwarfs and their strong magnetic fields. It was also generally agreed upon that the physics in substellar objects operate with different age (internal temperature) and different irradiation conditions (effective temperature) across the four different area of expertise. Thus, insights in variability in one class of substellar atmospheres are complementary to other classes.

The format of the workshop and diverse set-up of participants was praised by many participants. It consisted of two days of keynote lectures to introduce the four fields. Furthermore, we held lightening card events on the first two days that allowed each participant to introduce their work and themselves to the other workshop participants. Keynote splinters were set up interactively on-site, where we gathered ideas and suggestions for possible sessions beforehand via a google document. The splinters were covering all the topics of interest and results were presented at the end of each day, when the splinter was held, to all participants. We also had two major "all-hand" discussion that lasted each 1 hour, during which all participants engaged in a respectful and lively matter.

Also a training session was held in the form of a "describe your favorite object" session to train (in particular early career) scientists in honing their skills to "pitch" a particular target of observation for proposal writing.

Furthermore, care was taken to ensure a gender balance in participants, and in having early career scientists along-side designated experts and leaders of their field. Last but not least, we gathered experts from the US, Europe and Chile. Unusually, seven of our eight keynote speakers where women and among those two were women of color. Overall about 40 % of the participants were women. About 50 % were early career scientists (master, PhD students and postdocs on their first term). This balance proved to be very beneficial to make the discussions lively and worthwhile for all participants.

Tangible outcomes were the following: Participant Ernst de Mooij initiated an observation proposal writing session after the workshop was concluded on the Lorentz site to investigate if high resolution spectroscopy, a technique that was pioneered in the atmosphere characterization of transiting exoplanets, could also be of use for the observation of brown dwarfs. Participant Leigh Fletcher offered to share opacity data that were gathered during Solar System space missions but were never made publicly available. Furthermore, Leigh Fletcher invited the participants to prepare themselves for white papers to justify the scientific benefit for a Solar System space mission to Uranus and/or Neptune and how such a mission would benefit their respective areas of expertise. Participant Kelle Cruz proposed to encourage/train people to use a repository of data and techniques, a "Shared data infrastructure" to be collected to prevent "loss of knowledge" that is prone to happen at the end of projects (like the data offered by Leigh Fletcher). It was proposed by Kelle Cruz to initiate a dedicated archive in particular for brown dwarfs and directly imaged planets, for which such an infrastructure is still lacking in the form of e.g. "SIMPLE archive of directly imaged planets and BDs."
It was further agreed on to investigate the possibility to have two follow-up workshops, directly based on this Lorentz Center workshop. One in the US (participant/organizer Jackie Faherty, Aspen) and one in Germany (participant Paul Mollière, Ringberg).

All talks were gathered in a common repository and are accessible to all participants also after the workshop. For all splinter sessions and the discussions notes and pictures of the blackboard were taken and collected in a google document. This documentation is available for future reference to all participants even after the workshop.

Ludmila Carone (Heidelberg, Germany)
Jackie Faherty (New York, US)
Matt Kenworthy (Leiden, The Netherlands)
Michele Bannister (Ōtautahi-Christchurch, Aotearoa New Zealand)

Noise Reduction Technologies with Meta-Materials

10 - 14 February 2020 @Snellius

The workshop combined several topics: aeroacoustics, advanced materials, such as 3D additive manufacturing, and their industrial applications. The workshop theme focused on a series of technological advances and scientific studies which, in the last decade, have been carried out with the aim of reducing the acoustic noise of aircraft, wind turbine blades and many other mechanical systems. The noise reduction is obtained by employment of bio inspired meta materials (e.g. permeable and porous materials). The term "meta" refers to the fact that the properties of such materials cannot be found in nature.

Organization

Daniele Ragni and Francesco Avallone are Associate and Assistant Professors from the Aeroacoustic Group of TU Delft in the Netherlands, focusing on meta materials from an experimental, numerical and analytical understanding. Mahdi Azarpeyvand is a reader in aeroacoustics from the Mechanical Engineering Department of the University of Bristol. His research and expertise touch upon a broad range of fields, including aerodynamics, aeroacoustics, fluid mechanics and fundamental turbulence.

Scientific

Aeroacoustic noise is a well known challenge which has attracted interest especially in aircraft and wind turbine applications. Several passive and active noise reduction techniques have been lately proposed, such as boundary layer injection/suction, aeroacoustic optimization of the geometries, or the usage of trailing edge extensions. The latter have been motivated by nature, smartly mimicking the properties of birds' wings. Hence several studies of trailing edge serrations or trailing edge permeable brushes have populated the scientific literature.

In this workshop initiators and users of this approach have been invited (for example, Tomas Geyer, Michaela Herr, Stefan Oerlemans).

Among other new promising technologies, the usage of "meta materials" in the form of permeable surface treatments has shown huge potential, with achieved noise reductions up to 10 dB in several applications.

Despite the interesting results, many fundamental questions have been raised for the follow up workshop, in particular:

- Experimental challenges: what are the correct methodologies for the characterization of such materials, including consistency of the definition and repeatability of the measurements.
- Numerical challenges: how to correctly model the micro properties of the geometry into the macro response of the materials. What are the correct surface boundary conditions and how is it possible to carry out a proper validation?
- Application challenges: several applications need an ad hoc material (e.g. leading/trailing edge noise, bluff bodies, cavities, boundary layer control, acoustic liners, shedding etc.). Is it possible to categorize each noise reduction technology per application? Which are the most important parameters for the purpose (i.e. Mach number, Re and Strouhal numbers)?

Up to now, it is not clear yet to the scientific community how the permeability, porosity and tortuosity of different materials are interlaced in the determination of the noise reduction of several aerodynamic geometries.

The organizers team would like, with the follow up workshop, to combine the broad expertise of the invited participants to solve some of the fundamental questions raised in the first Lorentz Center one. In particular, understanding the link between material and flow characteristics and elucidating the physical mechanisms behind the noise reduction, will allow the scientific world and the industrial community to design materials for noise mitigation ready for a variety of applications in aviation and wind energy.

Tangible outcomes and scientific discoveries

Several tangible outcomes and scientific discussions and breakthroughs have populated the workshop, with the possibility of combining the expertise of different backgrounds into a three days discussion. Among many it is worth mentioning:

1. The way the aeroacoustic meta materials are currently built rely on porosity to obtain a specific permeability to the pressure fluctuations. Lectures from experts in material modelling and science has shown the possibility of using 3D additive manufacturing and advanced polymers to obtain the same characteristics with less roughness effects.
2. Experts with non-acoustic background have suggested that to characterize the materials additional parameters beside permeability and resistivity might be necessary. In the discussion it was pointed out that two groups had already two different formulas for the same parameter, which determined some confusion in the past.
3. Simulation from the organizers demonstrated that the permeability has an effect that is limited to a specific region of the full material, and dependent on the characteristics of the flow features. This has motivated the benchmarking activities proposed in the following.

Short term and Long term planned activities

Several activities have been already planned and proposed in the coming months. Among the most important the following have been decided:

1. Preparation of a second workshop after the AIAA-Aeroacoustic Conference in Reno (June 2020) to be held in the Von Karman Institute of Fluid dynamics. The workshop will be combined with the end of one of the EU funded projects: Innovative Training Networks SMARTAnswer, focusing on noise reduction technologies applications (end of November). Focus of the next workshop will be on two main applications: leading/trailing edge applications.
2. Participation in EU upcoming calls on Meta materials and preparation of topics to be proposed to the NWO schemes.
3. Experimental benchmarking:
    Inclusion of meta materials in the form of porous diamond inserts in the follow up of the BANC statement problem to assess the experimental and computational capabilities of the community in the area of physics-based prediction of broadband laminar and turbulent boundary-layer trailing-edge (LBL/TBL-TE) noise. The goal of the assessment is the advancement of state-of-the-art prediction methods with correct tuning based on different models in 3 different facilities in a range of Reynolds number extending up to 5 million. To collectively push the state-of-the-art beyond the current level, we kindly invite applications from users and developers of various LBL/TBL-TE noise prediction approaches covering the full bandwidth of existing semi-empirical, theoretical and hybrid methods. Additionally, noise prediction approached based upon computational aeroacoustics (CAA) in combination with unsteady Reynolds-averaged Navier-Stokes (URANS) solvers, large eddy simulation (LES), detached eddy simulation (DES), lattice Boltzmann methodologies (LBM) and RANS with stochastic turbulence models are encouraged to apply.

4. Numerical benchmarking:
   Lattice Boltzmann simulations of meta materials in the form of porous diamond inserts for benchmarking of the interaction between acoustic and hydrodynamic pressure waves in the inner structure of the material. Benchmarking with the combined aerodynamic and aeroacoustic flow field propagated at the receiver level to be presented in the next work shop.

Mahdi Azerpeyvand (Bristol, United Kingdom)
Francesco Avallone (Delft, Netherlands)
Daniele Ragni (Delft, Netherlands)

Lorentz
center

Processing Ancient Text Corpora

17 - 21 February 2020 @Snellius

Description and aims

This workshop aims to promote scholarly exchange and to build a community of scholars with an interest in digital humanities and ancient texts. Research into ancient texts undergoes strong development: the application of ever more methods from statistics and machine learning. Given the fact that the text disciplines are organized by language, rather than by method, we think the methodological exchange can be strengthened. The sharing of IT techniques is a natural playground for this, but only a starting point. Theoretically, we need to discuss where these methods bring us. Are big data methods also applicable to small data? What is particular about the fact that the texts of interest are historical? Practically we want to discuss how we can optimally employ IT methods. Can we assess the landscape of IT and make an informed selection of the regions that are most useful to us?

Tangible outcome

We found two aspects of text processing at opposite ends of a spectrum that deserve closer interest: Material: ancient text corpora have a very material dimension: manuscripts, tablets of clay, inscriptions in bowls. Text should not only be annotated with linguistics and interpretation, but also with material traits.

Interface: many classical are stored in the Perseus Digital Library, from where they are accessible in an online reading environment, the Scaife Viewer. It does not accommodate intensive processing but it could support Text-Fabric import and export, so that results of computing can be brought back to the reading environment. One of the participants has already written code that can convert texts in the Perseus library to TF. Two others are overseeing the renovation of the Scaife. There was definite interest to develop TF-interoperability in Scaife.

Breakthrough

A problem that all participants gave a good deal of thought was: how exactly can philologists adopt computing as a tool in their research? Should they partner with web developers and data scientists? Should they become software engineers themselves? Will research software engineers be able to wade through the huge amounts of domain-knowledge of philologists before becoming actually useful? Machine learning is great, but it cannot be applied to philological data without careful consideration, and it needs conscious effort to make sense of the results. Corpus-driven software for language learning is an art of its own, which can help scholars to make sense of corpora in languages outside their expertise.

Then it dawned upon us that processing ancient corpora is a skill on its own. We need to identify as a guild, in order to develop the tools of our trade and instill them in new students. Instead of soldiering on with ad-hoc IT solutions, we must find our way competently in the vast array of IT tools and frameworks.

We will reinforce the competence of a computing philologist. We need to anchor it in organizations, and if needed, we will create a new one, such as a Text-Processing Foundation.
"Aha" moments

When dealing with historical texts, there is so much more information than the bare text: the context. Moreover, philology is interested in the human mind as it leaves traces in the material world. When processing texts, it is a challenge to make use of that information. It is important to collect and represent it in knowledge organization systems, such as the Semantic Web, rather than tying it too closely to a corpus.

Format of the workshop

The workshop was conducted in an informal way. We did have lectures, but also sessions for hands-on work and discussions. However, during the workshop it turned out that many attendants took the opportunity to convene in small groups to work on the issues at hand. The hands-on sessions were too short to let everyone set up his/her computer properly. The planned discussion sessions gradually gave way to spontaneous work in smaller groups.

Comments

Next time we will reserving more time for hands-on sessions, effectively shifting to a boot camp setup. It remains important that participants can select and develop topics during the event.
Certainly, the current accommodation, with one big space and several smaller spaces, would also be well-suited to such a format.

Presentations archived at ZENODO 10.5281/zenodo.3719091

Wido van Peursen (Amsterdam, Netherlands)
Nicolai Winther-Nielsen (Copenhagen, Denmark)
Cody Kingham (Cambridge, United Kingdom)
Dirk Roorda (The Hague, Netherlands)

Lorentz center

Intersectional Analysis of the Sexed/Gendered Brain

2 - 6 March 2020 @Oort
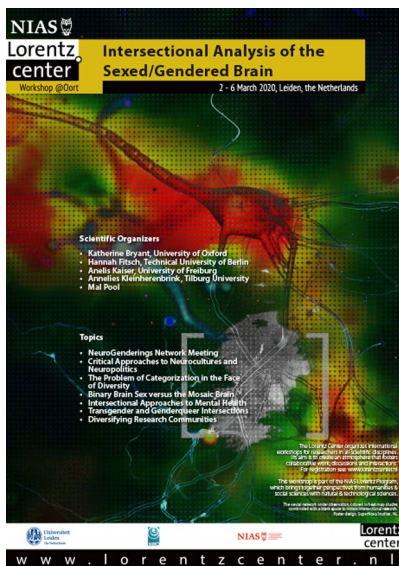
Description

Neuroscience plays a powerful role in our understanding of human differences. In recent years, scholars from the humanities have collaborated with neuroscientists to critically examine the body of neuroscientific research that purports to find essential sex/gender differences in the human brain, and have revealed conceptual and methodological flaws that hinder scientific progress. However, these critical efforts have often failed to integrate race, class, and nation (Jordan-Young, 2014, Ngubia 2014).

Attending to the interplay of various kinds of differences (i.e. to *intersectionality*) is of fundamental importance if we want to do justice to the plurality of human experience (Roy, 2008). The aim of this workshop was to advance the interdisciplinary conversation surrounding sex/gender and the brain by exploring intersectional approaches from a post-colonial, queer, trans, and black feminist perspectives, to expose biases, and to propose alternative research approaches.

Aims

- Discuss ethical, conceptual and methodological best practices for tackling the research questions that guide this workshop;
- Make significant progress in the production of content that will ultimately be published in an edited volume of scholarship;
- Develop a roadmap for future directions of the research community.

The organizers put together plans for publishing papers based on the outcome of this workshop – one for a Frontiers of Sociology special issue, to be edited by organizer Hannah Fitsch and attendee/contributor Flora Lysen. This call for papers will be sent out within the next few months, and will ask for work based on workshopped projects presented during the workshop, with a special request for collaborations between senior and junior scholars that emerged from the breakout sessions. Second, plans for the Reader aimed at junior scholars and scholars-in-training were specified. This Reader will contain a combination of seminal works from senior members of the Network, articles that have been published in the Frontiers
special issue, and new, state-of-the-art articles focusing on the future directions of feminist neuroscience. Core members of the group agreed to serve as an advisory board to guide the content of this Reader. Sarah Humphreville, the Science and Technology Studies Editor from Oxford University Press is working with the organizers to develop the proposal for this volume.

New themes that emerged from this conference were the beginnings of the integration of race and trans issues into discussions on neuroscience research. The contributions of scholars of color and trans scholars enriched and informed our discussion of the ethical,
legal, and social implications of neuroscience research. Neuroscientists learned and developed strategies to apply multidimensional categorical frameworks to their own research programs. Trainees built collaborations with more senior scholars that they believe will have lasting impacts on their careers. Several scientific and philosophical collaborations amongst senior scholars were also initiated as a result of the conference. Finally, a new artistic collaboration between one of our keynotes and a longtime core member of the group, along with several junior interdisciplinary scholars, was announced. These developments will be chronicled on the Neurogenderings Network website.

Format of the workshop

The workshop format was composed of several key elements: keynote lectures (Deboleena Roy, Ash Baccus-Clark), works-in-progress presentations, tutorials, roundtables, and breakout sessions.

Other comments

Our third keynote was unable to present due to travel restrictions due to COVID-19 (Laverne Melon). We condensed the majority of parallel sessions into plenary sessions because of speakers who were unable to attend, also due to COVID-19.

Annelies Kleinherenbrink (Tilburg, Netherlands)
Katherine Bryant (United Kingdom)
Hannah Fitsch (Berlin, Germany)
Anelis Kaiser (Freiburg, Germany)
Mal Pool (Berlin, Germany)

Lorentz center

Positive Affect
Nature, Neurochemistry and Function
2 - 6 March 2020 @Snellius

To facilitate a multidisciplinary approach, this small-group Lorentz workshop gathered researchers from different disciplines. The first important goal for the workshop was to come to a shared understanding of the following four key questions:

- What is a meaningful taxonomy of positive emotions? What is their evolutionary origin? How can positive affect be induced and measured?
- How do hedonic states differ from (approach) motivation?
- What are positive emotions good for? How do positive affect and motivation influence cognition?
- What neural and neurochemical systems support affect and motivation and how do they interact? What neurocognitive processes underlie disturbed positive affect in psychopathology?

A second important aim of this workshop was to identify concrete research methods to help answering these questions.

The third overarching and major goal was to write a perspective paper that sets out a research agenda for a multidisciplinary approach to the study of hedonic states. If there was sufficient interest among participants, we would aim for a full special issue.

The workshop can be considered a great success: researchers across the globe and from very different disciplines came to this workshop in Leiden and learned a lot from each other. Most breakthroughs happened during the small-group discussions in the afternoon when participants tried to merge insight from each other's fields. During the week all participants started to realize that we only have a very basic understanding of what positive affect is and that there are many open questions that we have to address in the future. We also learned that there are multiple methods available to answer these questions and that all these methods are required to advance a full understanding of the multifaceted nature of positive affect.

Most of the attendees really enjoyed the open format and the opportunity to have many discussions in small groups. One respected senior researcher with a neuroscience background told Henk (main organizer) at the end of the week that this was the best workshop he ever attended and that he never learned that much during a workshop!

At the end of the workshop, all participants indicated they would be interested in contributing to a full special issue in a scientific journal. Immediately after the workshop, the organizers therefore contacted relevant journals whether they would be interested in a special issue on the topic of our workshop. We are proud to report that the prestigious journal *Current Opinion in Behavioral Sciences* (IF 3.422) offered us the opportunity to host a special issue on Positive Affect. The organizers of the workshop are guest editors on this special issue. In addition to the workshop attendees we have also invited other key researchers in the field to contribute to this special issue. About 40 authors (including the majority of the workshop attendees) have expressed their interest. From September 1, authors can submit their manuscript and we as organizers have currently already about 20 papers under review. The full special issue will be published in spring 2021.

The organization went well and the specified program worked well. Participants enjoyed the venue. Also the boat trip and dinner was enjoyable. There was some confusion about the refund about the hotel costs because participants paid at the beginning rather than at the end of their stay. However,

Gerda Filippo reached out to the participants and this appeared to be solved easily. Lorentz support staff in general was very kind and helpful. The only minor point for improvement is that the technical knowledge about linking beamers and sounds etc. was limited. We needed a special setup with zoom and webcam etc. because some participants from the States decided not to join (COVID-19 just arrived in the Netherlands that week!); luckily the organizers had sufficient technical skills to solve this themselves.

@Lorentz center team: Thank you all for making this workshop a big success!

Henk van Steenbergen (Leiden, Netherlands)
Disa Sauter (Amsterdam, Netherlands)
Siri Leknes (Oslo, Norway)
Gilles Pourtois (Ghent, Belgium)
Blair Saunders (Dundee, United Kingdom)

Hot but Habitable

9 - 13 March 2020 @Snellius

A team of 20 interdisciplinary practitioners and researchers who work to manage the risk of extreme heat, technologists, designers, and data scientists gathered in the Lorentz workshop 'hot but habitable'.

The aim of the workshop was to identify transdisciplinary digital systems-based solutions to minimize the impact of heat waves on the habitability of our cities, the enjoyment of the outdoors, and the health of our people. We focused on how to improve global heat risk and impact monitoring and how to better track, predict, plan, and respond to cascading and simultaneous heat triggered risks, such as extreme heat coupled with power failures, water insecurity, fires, air quality.

Background of the meeting was that humanity is rapidly being hurled into a warming future climate. We face certain exposure to more extreme heat events and warmer climatic conditions over the coming decades. Higher temperatures represent significant risks to how we live, how we get sick, and how we may die. Populations on all inhabited continents are vulnerable to heat exposure, labor productivity is in decline due to rising temperatures, and urban centers and the urban poor are at particularly high risk of extreme heat. We are not prepared for these present realities, nor are we innovating quickly enough to meet growing future challenges with sustainable solutions. But a new global network of is rallying to create new solutions to this problem: the global heat health information network (http://www.ghhin.org) that formed the backbone of the meeting participants.

The workshop proceeded successfully using the Open Space Technology (OST). OST is a method for organizing and running a meeting or multi-day conference. In contrast with pre-planned conferences where who will speak at which time is scheduled often months in advance, and therefore subject to many changes, OST sources participants once they are physically present at the live event venue. The facilitators were able to create a climate in which the participants felt comfortable to share ideas and start new collaborations. In the first day of the workshop we defined the main themes and got inspired by a visit to the Boerhaave museum. During the remainder of the week we processed the main themes in more detail in flexible meetings. This resulted in 18 open space reports, with not only focus on content, but also on policy and communication. The group will draft a final report on the main findings and recommendations and scientific journals have expressed interest to publish it.

After the Lorentz meeting, the workshop proved to be effective to quickly form a team of experts dedicated to defining guidelines on how to cope with the combined threat of heat waves and COVID-19 virus.

Hunter Jones (NOAA, USA)
H.A.M. Daanen (VU Amsterdam, The Netherlands)
Joy Shumake-Guillemot (World Meteorological Organization, Switzerland)
Peter van den Hazel (Public Health Services Gelderland & Overijssel, The Netherlands)

Autonomous Behaviour in Living and Robotic Matter

23 - 24 April 2020 @Snellius

The aim of the workshop is to bring the different communities together and to identify the common open questions and physical principles related to feedback, characteristic length-scales and scalability underlying autonomous behaviour in the fields of soft, living and robotic matter. This virtual pre-meeting served to introduce workshop participants to each other and form a community from the very different backgrounds. We formulated topics and discussion direction for the actual workshop together with participants.

To introduce the different fields, each participants held a short 2-3 minute pitch to highlight their research. Based on these discussions, we had an open discussion with all participants on important topics, considerations etc. in the various fields. The next day, we organized an online speed-dating sessions, and ended with a central discussion to identify important topics for the next physical meeting.

Everyone seems to enjoy the introductory pitches and the speed-dating. Some personal connections/ potential collaborations have been envisaged already. Some interesting points were raised during the open discussion. What we could parse from it: we could gather everyone's interests and ideas for the organization of the real meeting in 2021. We also realized that people from different communities have different language, which can hamper mutual understanding. To address this challenge, the idea of having review talks on key areas (biophysics, robotics, materials science, …) was formulated. This would allow to kick off the meeting as well as creating a dedicated website where these review lectures could be accessible beforehand.

The virtual meeting lasted 2x2 hours. This was not enough time to reach the aims of our proposed workshop, but certainly help in kick-starting the discussion. A physical meeting at the Lorentz Center is the next step.

Organization

We requested submission of introduction pitches beforehand, to streamline the virtual meeting. We also requested "questracts", to organize the main questions from the participants, and to guide the discussion.

The virtual meeting lasted 2x2 hours spread over two days. The platforms that have been used before and during the workshop are email exchange and Zoom. The idea of having online lecture emerged, let's see if we manage to make it happen. We have now a clear idea of the 2021 meeting will be organized.

Introductory pitches and speed-dating is a great way to connect. General discussion difficult to lead for too many participants.

Comments/points for improvement for the Lorentz Center team:
Provide an online platform (website, youtube channel) to put/exchange material, provide suggestions for online meetings, perhaps be more active on the social media.

Karen Alim (Munich, Germany)
Corentin Coulais (Amsterdam, Netherlands)
Bas Overvelde (Amsterdam, Netherlands)

LIFE - Large Interferometer for Exoplanets

11 - 15 May 2020 @Oort

The original workshop goal of the in-person workshop would have been to assemble a collaborative manuscript/white paper on the LIFE mission concept. We decided this was not possible in the virtual format, and therefore aimed at presenting the current LIFE concept, both from a scientific and technical perspective, to a wider audience of people who were not familiar with it so far.

We had about ~180 unique participants and believe that the virtual workshop helped significantly in advertising the project to the community. We received positive feedback in the form of email follow-up conversations and direct discussions. A video recording of the virtual meeting can be found here. Additional registrations to the LIFE mailing list and concrete offers (~15) to actively support some of the working groups.

We advertised the workshop widely using several community mailing lists and Twitter. We had a strategy meeting how to handle the organization and send around discussion/participation rules via email to all registered participants upfront. About 2 hours were planned and the workshop took approximately that long. The platform(s) we have used before and during the workshop are Zoom, Slack, Email.

The short- and long-term plans for the follow-ups are an in-person workshop in June 2021. Before that another open workshop in November 2020 in Liége. Additional community involvement, presentation at scientific conferences.

We did not set a fixed deadline for the workshop registration. This was a mistake because people kept registering until the last minute and we then missed to send them the Zoom link. Next time we will stop registration 24h before the meeting. Having dedicated moderators for presentations is key, as the presenter cannot keep track of potential questions / comments that are communicated via chat channels. We also had a dedicated chat channel only for the organizers, which proved very useful.

The Lorentz Center could send out a short "tips & tricks" sheet for the organisers that could help in preparation, as indicated above and planned for future workshops. This may include technical aspects and pros and cons of the various videoconference platforms, e.g. Zoom, Microsoft Teams, Skype, etc.

Denis Defrère (Liège, Belgium)
Tim Lichtenberg (Oxford, United Kingdom)
Yamila Miguel (Leiden, Netherlands)
Sascha Quanz (Zurich, Switzerland)
Sarah Rugheimer (Oxford, United Kingdom)

Complexity from Quantum Information to Black Holes

2 - 5 June 2020 @Snellius

Scientific

The aim of this meeting was to bring together the high energy and quantum information communities in order to make progress towards putting holographic complexity proposals on firmer quantitative grounds. Specifically, we wanted to understand which definitions of complexity on the quantum field theory side are dual to the holographic complexity proposals, and conversely, which definitions on the gravity side are likely to reproduce natural properties expected from a definition of complexity motivated by quantum circuit design and information theory. We were also motivated more generally by the desire to establish greater communication between the two communities.

The workshop consisted of online talks followed by informal discussions. The program and schedule can be found on the workshop website (https://sites.google.com/view/complexity-workshop) and recordings are available at our YouTube channel (https://www.youtube.com/channel/UC4EvJVK7tFQYyO8JR6dJbgA).

The first day consisted mostly of review talks which helped establish a dialogue between the two communities. These talks accumulated a large number of live attendees and views on our YouTube channel as detailed in the statistics presented below. The talks on the subsequent days focused on various aspects of complexity while still being aimed at an interdisciplinary audience. To name only few examples of interesting discussions which developed during the workshop: 1. The possibility of establishing a resource theory for uncomplexity following Nicole Younger-Halpern's talk (some of the participants started actively working on that in collaboration following the workshop), 2. Complexity definitions in conformal field theories following Pawel Caputa's talk (this discussion lasted almost 2h after the talk and some of the participants continued working on that after the workshop), 3. A discussion about the complexity of mixed states (two papers that came out during the workshop), which was coordinated spontaneously during the workshop.

The workshop enabled a dialogue between the high energy and quantum information communities, which we believe was extremely useful for better understanding the relation between complexity and black holes. An added value to the online nature of the workshop was that it allowed a large number of young researchers to attend. We plan to have a follow up workshop next year (hopefully in person) and are hoping to make it an annual tradition in the years to come.

Organization

Registration to the workshop was open and conducted using a Google form. **The workshop generated a lot of interest and we eventually had 499 registered participants.** The workshop lasted for 4 days and we used the following virtual platforms: most importantly Zoom (with the 1000 participants extension), YouTube, Google Sites (for the workshop website), and Slack (group instant messaging). Before the start of the workshop we sent around logistical information to all registered participants. Before the first session, we had a short introduction where we briefly reminded everyone of the aims of the workshop and the logistics (how to ask questions, etc.). Each talk was scheduled for 40 minutes with an additional 15 minutes for recorded questions. A short break was held between the talks. Each session was followed by unrecorded informal discussions.

The workshop participants were located around the globe (including speakers from Asia, North America, and Europe). We therefore divided the workshop schedule into two sessions—one in the morning and one in the evening (European time). The first session was attended by participants from time zones in Asia and Europe, while the second one was attended by participants from time zones in the Americas and Europe. The talks were uploaded immediately to the workshop YouTube channel so that participant from the other time zones had the opportunity to watch them before the subsequent session (asynchronous strategy). We felt this strategy was quite successful. The recorded talks remain online and are still being watched (see statistics below).

During the talks, participants were encouraged to leave their cameras on to generate a more friendly atmosphere and to ask questions either directly or using the chat. Each session was chaired by one of the participants, who was also in charge of reading to the speaker questions from the chat. In general, we found that this worked well and generated a lively atmosphere in which people felt comfortable asking questions. After each session, we had further informal discussions to allow participants to ask "off the record" questions. These were very successful and lasted long after the scheduled end of the session.

We also left the Zoom room open throughout the day for additional spontaneous discussions. Such discussions took place twice during the workshop during the afternoons of 3 and 4 June.

Additional communication between participants was done using Slack, which is an instant messaging system which allows to create discussion channels. On the first day of the workshop, we encouraged people to introduce themselves on Slack. Overall, Slack was mostly used for announcements and coordination.

Statistics

Registration: **499 participants**
Simultaneous live attendees on Zoom: **max 224; average: 137.**
Average duration of discussions following each session: **max: 1h 33min; average: 47min.**
YouTube views (as of August 01/08/2020): **5225 total; 1048 max/video; 307 average/video.**

Lorentz Center Support

Our Lorentz Center coordinator joined some of the virtual activities, which we appreciated. We would also like to acknowledge all the support that we received before transitioning to the online format. We found the webpage with tips for virtual workshops (https://www.lorentzcenter.nl/virtual-workshops.html) very useful.

Jan de Boer (University of Amsterdam, Amsterdam, The Netherlands)
Michal Heller (Albert Einstein Institute, Potsdam, Germany)
Michael Walter (University of Amsterdam/QuSoft, Amsterdam, The Netherlands)
Ro Jefferson (Albert Einstein Institute, Potsdam, Germany)
Shira Chapman (University of Amsterdam, Amsterdam, The Netherlands)

The Paradox of Genres in Discourse

8 - 10 June 2020 @Oort

Discourse genres are important in our everyday life. Being able to function in society requires having a sufficiently large repertoire of genres at your disposal: one should know how to perform in a job interview, how to fill out a tax form, how to read news or governmental information. In an era in which new technologies are introduced at great speed, new genres develop on the fly. This makes genre studies an interesting and dynamic field. Interestingly, however, our scientific knowledge about genre is limited. Genre is a complex and multifaceted concept, comprising linguistic, pragmatic, and content-related knowledge with psychological, social and communicative aspects. The concept of genre thus crosses traditional theoretical and disciplinary borders. This workshop brought together researchers from different disciplines in social sciences and humanities to further our understanding of the notion of genre.

Goal of the virtual preparatory was to jump-start our genre community (one of the main goals of the workshop) by getting to know each other's work and to prepare for the real workshop. We aimed at bringing together researchers from different disciplines and different perspectives to work towards a more coherent, multi-disciplinary conception of genre. We asked 13 keynote speakers to prepare 7-minute presentations to sketch their take on genre, the burning issues they identify with respect to genre research, their favorite methods to study genres, and/or the iconic publication that they always refer to when doing genre research. Because of the online nature of the presentations, we invited the presenters to make so-called slide decks, where a very limited number of rich slides are used that are made more or less self-contained by including extra information compared to the oral presentation.

The first day started with two slightly longer presentations from two of the organizers (Spooren, Bateman), the last day ended with a summarizing overview of the key points from the workshop by one of the organizers (McNamara), and a sketch by the fourth organizer (Stukker) of future directions and the invitation to contribute to a Google Sheet containing important topics to pursue for the real workshop (July 2021). All in all there were 37 participants, from different countries (BE: 2, DK: 1, GE: 2, IT: 2, NL: 22, UK: 2, US: 6) (note that a number of participants from the Netherlands have an international background (Iran, Italy, Greece). All talks were followed by intensive discussions.

Key debates identified during the session discussions concerned the notions of multidimensionality and multimodality of genres, the role of language in identifying genres, and the dynamic nature of genre: the fuzziness of the genre concept proved very central to its nature. A clear result was also that these kinds of conversations are crucially important for clarifying our conceptualisation of the genre notion.

Outcome(s): all presentations have been made available to registered participants (with one exception, for publication reasons). A Google Sheet was made available for participants to provide suggestions for follow-up discussions. This has presently resulted in a list of 34 suggestions. The Google Sheet will remain available and open for editing until the next workshop.

Other comments: the Virtual Preparatory Sessions seem to have fulfilled their goal to create the community, and have effectively laid the basis for preparing the real workshop.

Organization

Preparation: the careful instructions to the presenters and the use of the slide decks helped in creating rich presentations that allowed participants to understand each presenters' take on genre.

Duration of the workshop and time management: the 2 hour sessions over three days were very much suited for the goals of these Virtual Preparatory Sessions and we can certainly recommend this form. Platform(s) used before and during the workshop: we made use of the Arizona State University's Zoom account (password protected), which suited the participants' needs.

Short- and long-term plans for follow-ups: preparing the real workshop, using the issues brought up by the participants. We will consider inviting other guests (now that dates have changed people who previously mentioned not being able to attend may be available in July 2021).

Lessons learned for future virtual events: the sessions should not last longer; the format did not really allow for break-out sessions and the like, for which we really need a live presence or already agreed tasks for working groups.

The support from Lorentz was very welcome (keeping in touch with participants, consultations about formats). The Center did not have a virtual environment available, nor was there the possibility to store recordings of presentations. Lorentz might want to consider facilitating that type of format in the future.

Ninke Stukker (Groningen, Netherlands)
John Bateman (Bremen, Germany)
Danielle McNamara (Arizona State, USA)
Wilbert Spooren (Nijmegen, Netherlands)

Othering and Polarization

9 - 11 June 2020 @Snellius

Scientific

'Othering' and polarisation have immediate and potentially severe consequences for politics across Europe – in terms of Populist denigration of sub-groups but also when politics is so divided that each side will not listen to the other (e.g. Brexit in the UK). Unfortunately, relevant theory, knowledge and perspectives on these phenomena are splintered across many disciplines, ones that normally do not talk to each other. We aim to bring these different fields together to develop a more nuanced and complete understanding of these phenomena. Given COVID-19, the face-face meeting has been postponed until next year. However a reduced virtual meeting was organised to start the interdisciplinary process and maintain interest.

The key contrast in perspectives in this workshop turned out to be between the individual, social psychological view and the macro-level sociological and political view (with agent-based modellers having a foot in both). There were particular discussions on racial division and conflict in the US, with a sub-discussion on Police Culture and a discussion on othering and migration. Traces from the meeting (slides, brainstorms) are available at https://otheringandpolarisation.org/virtual-meet/

Two particular actions were decided upon: (a) the development of some agent-based models to link the social psychology and the social level processes and (b) an exploration of possible joint grant applications we could make together. These are being pursued on the Slack Channel.

Organization

This workshop happened for 3 hours each day (3-6pm CET) on the 9th, 10th and 11th June 2020 (with a short break in the middle), and consisted of a mixture of introductions, talks, breakout discussions, brainstorms and fish bowl discussions.

The meeting happened using Zoom (professional), which is easy to use, relatively stable in conditions of low bandwidth and is flexible. This worked well for the talks, and fishbowl discussions but was particularly effective for breakout groups of size 7. In parallel to the Zoom meetings, we used PadLet - a tool for collaborative flowcharting/brainstorming.

Only about 2/3 of those who had registered turned up for the meeting, so some though needs to be put into ensuring participation in future (although these are particularly challenging times).
Before, during and after the meeting, two channels for communication were set up: (1) a blog-website (https://otheringandpolarisation.org) and (2) a Slack channel for structured discussion and sharing of papers/news without blocking up people's email (https://othering-polarisation.slack.com).

Another meeting is being organised during Social Simulation week in September (https://otheringandpolarisation.org/soc-sim-workshop) combined with the network on modelling social identity. Discussion will continue in the build up to the face-face LC workshop next year and it is possible we will organise another virtual meeting late in 2020/early in 2021

Lorentz Center (virtual) Support

Virtual meetings are a new area for the LC staff, so they mostly just observed and discussed with us our goals, approach etc. before hand. No doubt they will quickly learn from doing a lot of virtual workshops this year.

Bruce Edmonds (Manchester, UK)
Julia Eberlen (Brussels, Belgium)
Geeske Scholz (Osnabrück, Germany)
Wander Jager (Groningen, Netherlands)

Symplectic Dynamics Beyond Periodic Orbits

10 - 14 August 2020 @Oort
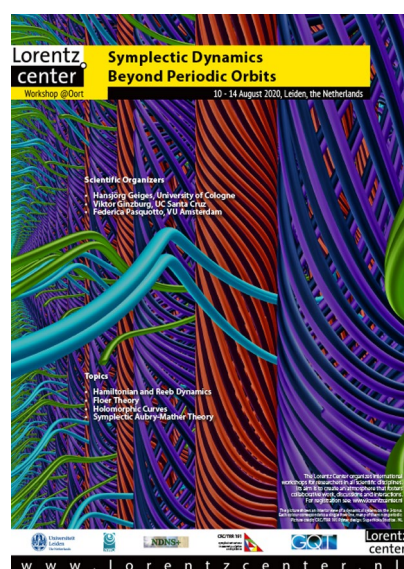
Motivation

The aim of our workshop was to focus on some of the most exciting recent developments at the interface of dynamics and symplectic topology concerning applications of symplectic topological methods to the dynamics of Hamiltonian systems beyond periodic orbits. While in essence symplectic topological techniques, such as Floer theory, are ultimately based on periodic orbits or interactions between periodic orbits, these recent developments convincingly show that subtle dynamics information is accessible to symplectic topology and what we see now is only the beginning of the story. The workshop was meant to be organised around the following three groups of results and directions: Dynamics of Pseudorotations, Invariant Sets and Ergodic Measures, Topological Entropy via Floer Theory.

Workshop program and participants

The workshop was initially intended to take place at the Lorentz Center, with 3-4 talks of 45 minutes every day and plenty of time for formal and informal discussions. We were also planning a few short presentations by graduate students and postdocs, intended to encourage their interaction, both among each other and with senior researchers.

Unfortunately, travel restrictions and personal concerns forced us to cancel the physical meeting at the last minute and replace it with an online event, with a reduced schedule: two online talks every morning and dedicated "question and answer" sessions in the afternoon.

While initially we were disappointed by the fact that the meeting could not go through in the intended format, we ended up sincerely enjoying the online event. A more or less constant group of about 30 people attended the talks and participated in the discussions. Many of our main speakers were present (for instance, Felix Schlenk, Peter Alvers, Eva Miranda), and we were able to include at least one talk by a PhD student in the program (Irene Seifert). The atmosphere was excellent and we feel quite certain when saying that everyone, including the younger researchers, felt very much "included", both during the scientific parts, but also during the more informal, friendly conversations.

Conclusion

Even though the workshop did not achieve all of the goals we had in mind, partly due to the reduced program and partly to the absence of some of the intended speakers and participants, we feel we can be very satisfied with the outcome. We saw the possibility of creating and online platform for fruitful and engaging scientific discussion, and we feel that young researchers could benefit from the excellent talks and the opportunities for informal interactions with more senior researchers.

Moreover, we think one new theme definitely emerged from the workshop as new and exciting, namely very original applications of the theory of polyfolds to "classical" problems in analysis, geometry and topology (isoperimetric inequalities, delay equations, fillability). We feel confident that this will be a very fruitful direction of research in the near future.

Acknowledgement

We thank the Lorentz Center for the willingness to host our workshop, and Eduardo and Tanja in particular, for providing excellent support through all the different phases of the workshop organisation, including the one where we had to make difficult choices (cancel the workshop or replace it with a reduced online program).

We also thank GQT, NDNS+ and DFG for the financial supported they granted us, even though we could not make use of it in the end.

Hansjörg Geiges (Köln, Germany)
Viktor Ginzburg (Santa Cruz, United States)
Federica Pasquotto (Leiden, The Netherlands)

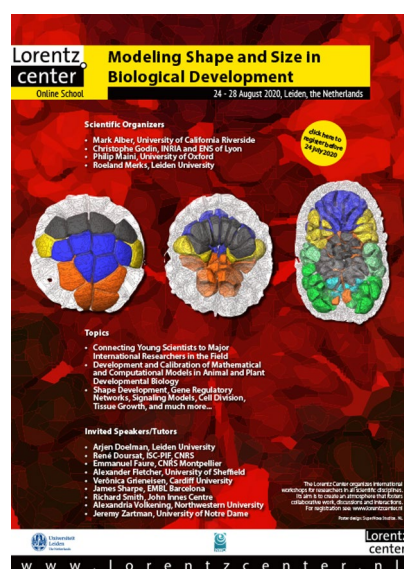# Modeling Shape and Size in Biological Development

24 - 28 August 2020 @online

Scientific aim

This online international summer school, which involved 66 student participants and 14 speakers from 12 countries, focused on multiscale mathematical and computational models in Developmental Biology. Such mathematical models, calibrated using specific experimental data, are capable of providing mechanistic understanding of how dynamic descriptions of microscale and mesoscale cellular and subcellular processes, such as cellular growth and division, cell movement and interaction with the extracellular matrix (ECM), mechanotransduction and chemical signaling between cells, etc., are coupled with each other to exhibit tissue dynamics at larger macroscale spatial scales. In particular, modeling of the growth and shape of organs and organisms during development was of special interest. The summer school focused on the development of mechanistic modeling skills of the participants through participation in several team projects, whereas the equally important integration of imaging and data analysis tools (e.g., deep learning) with modeling was illustrated in several keynote lectures. Mathematically, the school presented multiscale mathematical modeling coupling discrete dynamical systems with PDE models in space and time, development of novel mathematical, analytical and computational methods for stochastic dynamical systems, differential equations, novel sensitivity analysis methods, and so forth.

The main scientific aim was to contribute to establishing Multiscale Mathematical and Computational Developmental Biology as a field. The educational goal was to define the combination of theoretical mathematical foundations and practical computational methods, as well as the interdisciplinary collaboration skills required by researchers and students to be successful in this field. Participants of the summer school had very diverse backgrounds, ranging from mathematics and physics to experimental biology. For some students it provided the first very important experience of international, interdisciplinary scientific collaboration, even more valuable at this time due to the COVID pandemic.

The workshop and summer school consisted of pre-recorded educational and scientific lectures and hands-on research projects, each of which was supervised by one of the international speakers. James Sharpe, Director of the EMBL in Barcelona, gave a public lecture on the role of Turing patterns in the patterning of developing limbs. The week of intense discussions and collaborations was concluded with a session of short presentations by twelve student teams on the outcomes of their research projects.

Each of the student teams consisted of four to five students led by one of the speakers, in many cases with the help of their PhD students and postdocs. Prior to the workshop, the speakers presented an open problem to their teams, and introduced them to a mathematical modeling and simulation framework to address it. Then, with the help of the speakers and their assistants, the students worked on their own solution to the problem. It was amazing how much could be done in only one week, despite the difficulties of working in an online format with time differences. For example, the team led by Dr. Alexandria Volkening of Northwestern University introduced stochastic cell interactions into their agent-based models of zebrafish skin pattern formation. A team led by Dr. Richard Smith of the Max Planck Institute for Plant Breeding Research in Cologne, Germany, introduced students to finite-element modeling of plant cell mechanics. The team led by Prof. Jeremy Zartman of Notre Dame University, IN, USA worked on modeling cross-talk between subcellular mechanics and chemical gradients, and a team led by Dr. Verônica Grieneisen of the University of Cardiff, UK, worked on modeling of organoids.

Besides the educational contributions, the workshop provided speakers and their PhDs and postdocs with an important opportunity to acquire hands-on experience of the main approaches of

mathematical modeling and the underlying mathematical methodology (and open problems) as well as presenting polished final results at a conference or in a paper.

The summer school will lead to a practical textbook on computational and mathematical modeling in biology, that will be accompanied by hands-on examples and exercises based on online research and educational lectures, as well on some of the student projects presented at the workshop.

Organization

Despite the obvious difficulties associated with running an online workshop, participants reflected on their experience as a very positive, useful and fun workshop week. Even social events were more fun than expected; we had coffee/late-night-snack breaks in the Leiden mornings, and even organized a workshop "dinner"/breakfast/lunch. The key challenge was, of course, to synchronize the different time zones without losing too much sleep. We solved this by having asynchronous, pre-recorded lectures that participants viewed in their local time zones, followed by synchronized Q&A sessions. The project teams independently found the best times for their discussion meetings, depending on the time zones of the participants. In some teams most participants were localized in a few nearby time zones, others were spread out all over the world. Quite a few of these teams made very good use of their geographical distribution, and handed over their work twice each 24 hours as a 'scientific estafette', in this way doubling their progress!

In the post-workshop questionnaire some participants asked that in virtual workshops the talks should be made available one week before, as the project work was indeed difficult to combine with listening to the talks in a relaxed manner. As organizers we certainly agree with that: it was also hard for us to stay up to speed with all lectures, even if for all speakers it was a challenge to get their lectures prerecorded in time, as we were all getting used to the software and the concept of a virtual workshop overall.

During and before the workshop, we made use of Kaltura Capture for the pre-recorded lectures. Plenary Kaltura Liverooms were set up, in addition to break-out Liverooms for the individual sessions. We encouraged teams to make use of these liverooms in order to create an open atmosphere where team members could once in a while join the discussions of other groups. In practice, this was hard to get to work, as it felt a bit awkward to suddenly appear and 'eavesdrop' in the midst of another team's discussion. We set up Slack channels to encourage interaction and communication which was very popular. We have since heard that new videoconferencing innovations such as Sococo and Networkapp now help to make the experience somewhat more similar to attending a conference in person.

In the short-term, we plan to make the lectures publicly available online, as a resource for students and researchers. In the long-term, we plan to integrate these into a textbook and online resource. The student participants have written reports on their research projects. Of these, selected projects will be invited to contribute detailed, hands-on tutorials for the book, based on the work they have done during the workshop. In weekly meetings the organizers are working out the details and planning the next steps.

Lorentz Center (distant and online) Support

The Lorentz Center team did a tremendous job in supporting the development of this workshop. At the time of the workshop, virtual workshops were a novelty to everybody involved. Despite this, the Lorentz Center team already had some really good advice for us, e.g., to work with synchronous and asynchronous events and to make optimal use of synchronous time. We all had to invent a lot and this worked out really well with only minor mishaps, of which the main one (the public lecture had to be postponed by one day) was entirely out of control of everybody involved – a Kaltura-server problem in the US. One small piece of advice/idea we would have is to send participants a small 'welcome package',

e.g., consisting of an LC name badge, a pen, a notebook and printed program. Such a small 'goodie bag' could really make participants feel welcome and bring more of the LC 'look-and-feel' to the participants of a virtual workshop.

Mark Alber (Riverside, CA, United States)
Christophe Godin (Lyon, France)
Philip Maini (Oxford, United Kingdom)
Roeland Merks (Leiden, The Netherlands)

Lorentz
center

(Dis)continuation of Antipsychotic Medication

28 September - 1 October 2020 @Oort / hybrid

Description and aims

Antipsychotic medication is effective for symptomatic treatment in schizophrenia-spectrum disorders. After remission, continuation of antipsychotics is associated with lower relapse rates and lower symptom severity compared to dose reduction/discontinuation. Most international guidelines recommend continuation with antipsychotic medication for at least one year. In clinical practice, patients often have a strong wish to stop earlier due to side-effects that affect their everyday social functioning. Recently, the guidelines have been questioned as the Dutch MESIFOS study showed that more patients achieved long-term (social) functional remission after early discontinuation of antipsychotic medication. Yet, the sample size was relatively small and their finding was not replicated in another recently published study. Psychiatrists, patients and family are unsure which medication regime to follow: to continue or not to continue?

To address this issue of uncertainty, we started the HAMLETT (Handling Antipsychotic Medication: Long Term Evaluation of Targeted Treatment) study in September 2017 (granted by ZonMw; www.hamlett.nl). In this large multicenter single-blind randomized controlled trial, we compare maintenance treatment versus discontinuation/dose reduction of antipsychotic medication in 512 patients remitted from first-episode psychosis. We now work together with 23 mental health care organizations across the Netherlands to reach potential participants. Worldwide, three other (dis)continuation studies are currently being conducted: TAILOR (Denmark), RADAR (United Kingdom) and REDUCE (Australia).

We invited junior and senior researchers, as well as clinicians and individuals with lived experience, with various backgrounds (psychology, psychiatry, linguists, data managers) from different countries, with the aim of exchanging experiences and knowledge and to better streamline our joint efforts on this important research topic. All (dis)continuation studies are currently in the first or second year of their implementation, so this was the ideal time to organize a joint meeting.

Tangible outcome

The encounters between our international colleagues at conferences have been very limited till now. This workshop at the Lorentz Center provided the unique opportunity to create an international community within this field of research. Ultimately, the main goal of this workshop was to enable a closer cooperation between scientists at both a national and international level by facilitating face to face in-depth discussions. Three tangible outcomes:

1. A summary describing the most important hurdles and difficulties encountered in the international studies, together with the (joint) decisions that were made to overcome these issues and identify common limitations of these kind of studies. These can be incorporated in the discussion section, when researchers will be writing up the results in the final research articles.
2. An overview will be made of the overlap between study variables between the international studies. Syntaxes will be prepared based on preliminary data in preparation of final data analyses, which are streamlined between the international studies as much as possible.
3. Joint research article(s) will be initiated, summarizing the first preliminary findings. Article(s) will be further prepared for publication after the workshop. An author group will be registered on PubMed.

Scientific breakthrough

The plenary lectures as well as the separate breakout sessions led to several new ideas. For example, improvement of the inclusion rate by involving psychiatrists and nurses in training on a national level instead of only via the institutions as currently the case. We have also discussed the extra measurements/work packages that will be added to the HAMLETT protocol before the end of 2020. The clinicians that attended the workshop provided important input on the selection bias that is inevitably created when recruiting for research. Together with the international investigators in this field of research that attended the workshop on Thursday October 1 2020 (Denmark, UK, Australia), we decided to form a large research group. This way, we can join forces by organizing similar meetings on a regular basis. The next meeting is already planned for April 2021, during the Schizophrenia International Research Society meeting for which we will send in a symposium on the topic of antipsychotic discontinuation. During the workshop, seven working groups have been formed. During the coming year(s), they will come together to work on specific research questions (see below).

- Guideline for tapering medication: Iris Sommer
- Ethical consideration on discontinuing antiypsychotics: Eóin Killackey
- Selection bias and baseline characteristics   Wim Veling
- Position paper + common definitions: Sanne Schuite-Koops
- Alternative study designs and analyses: Helene Speyer
- Tapering trajectories: Jim van Os
- Attitude of clinicians towards discontinuing: Martijn Kikkert & Joanna Moncrieff
- Harmonizing data (future plan, also legally sharing data): To be decided

"Aha" moments

It was very informative and inspiring to have all our researchers together and talk about the different areas of expertise that they bring to our study on antipsychotic medication use in first-episode psychosis (HAMLETT/OPHELIA study). The study team was also present, who actually perform study visits, as well as our experience expert and a representative from the family organization Ypsilon. This way, we could not only reflect on scientific relevance but also on what patients gain from study examinations and scientific output. Finally, it was truly exciting to have the international investigators in this field of research together in the same (digital) room for the first time, which was the starting point for several collaborative plans.

Format of the workshop

Given the COVID-19 circumstances, we had to change the format from live to blended. We ended up with inviting 20 participants to Leiden, the other researchers joined digitally using MS Teams. Also, in the original plan, we invited international researchers for the full four days. As it is quite tiring to digitally participate for four days, we chose to invite the international participants for Thursday October 1, 2020.

Other comments

The blended form worked well for us: the digital participants also felt involved. MS Teams has excellent features, in having a plenary "room" as well as separate break-out rooms to have multiple parallel sessions with a smaller number of participants. However, it proved difficult for some participants to attend as there were some additional safety features by Leiden University. Some researchers also used MS Teams with a different account than was registered for the Lorentz Center meeting, which resulted in no access. Moreover, the sound was sometimes difficult for digital participants, which made that strict use of the microphone and/or walking to the front of the room was necessary. Although we had to improvise throughout the week, we felt tremendously lucky that we were able to organize this blended workshop given the circumstances. The Lorentz Center team also had a lot of extra work improvising but provided us with as much support as possible.

Dr. Marieke Begemann (Groningen, the Netherlands)
Prof. Dr. Iris Sommer (Groningen, the Netherlands)
Prof. Dr. Wim Veling (Groningen, the Netherlands)
Dr. Helene Speyer (Kopenhagen, Denmark)
Zoë Haime (London, UK)

Space Science for Societal Challenges

22 - 23 October 2020 @online

Short description of the aims for the virtual meeting

The main aim was to bring together experts from space research, industry, education and public engagement fields worldwide in an atmosphere where they can discuss and find common grounds regarding societal challenges and discuss collaboration within the sector. An important focus was on the potential for a new "Space-KIC" (Knowledge and Innovation Community) for each sub-community, as an example of a structure that supports the sharing of knowledge, expertise and opportunities. Discussion of alternative structures for collaboration within the sector to share best practices was another aim.

Short summary of key moments (key debates, breakthroughs, etc.)

The workshop started with 2 plenary sessions to set the scene and introduce key topics, followed by 4 sessions targeted to specific communities within the sector (industry, research, education and public engagement), and closing plenary again. One of the more important talks was by Mari Vittoria D'Inzeo, representing the European Commission's DG DEFIS (Defence Industry and Space). She identified challenges in the European Space Sector and asked the community to think about potential solutions during remaining sessions.

Outcome(s)

- Text-based input from all participants on polls to be included in a report.
- Sharing of best practices and knowledge within ánd between communities of different stakeholders in the space sector. Especially the latter is of importance to the sector as these communities are not often bridged.
- Proposed ideas during the workshop: investigate the establishment of a space for development office, making the existing Communicating Astronomy with the Public (CAP) conference broader to include space experts (astronomy and space are separate fields that are often disconnected).

Other comments

This workshop was organised by two EU-funded projects spaceEU and Our Space Our Future in response to a call from the European Commission, inquiring about the need for a Space-KIC or other models of collaboration in the European space sector.

Preparation (synchronous and asynchronous strategies)

We did not include asynchronous content because most key participants were quite high-level and indicated they did not have time to prepare, read or contribute prior to the session or beyond the scope of a normal talk and discussion. We included polling with open and closed questions to gather input from all participants. A moderation company (Evenflow) supported the preparation and implementation.

Duration of the workshop and time management

1,5 days (day 1: 9:30-17:00, day 2: 9:30-14:00) broken down in seven sessions of 1,5 hours). Several sessions targeted a subgroup of the participants so we would not ask too much of their time and could expect their full attention in sessions where we needed it most. We compressed in 1.5 days instead of spreading it out over multiple weeks to maintain everyone's attention which is easily lost online. Timekeeping of talks was not optimal as moderators struggle to interrupt speakers. An automatic timer shown on the screen would be a better solution.

Platform(s) used before and during the workshop

Zoom & Mentimeter for interactive polling with help of a moderation company.

Short- and long-term plans for follow-up

Short term: a white paper, to be presented to the European Commission, as input from the space community to guide future policies. Connecting the participants of the workshop via a newsletter. Long term: the idea was suggested to look into establishing a "Space for Development" office to complement the existing Astronomy for Development office.

Lessons learned for future virtual events

- There are great tools (like whiteboard environments) to enable interactivity, but these take a lot of time and planning which we underestimated and therefore didn't use.
- Session length of maximum 1.5 hours worked well
- 1.5 days was a good duration to keep people's attention in the age of Zoom fatigue.
- The second day, we allowed more contributions from the audience by speaking up, this worked well in this group size (~40 participants + organisers).
- It remains difficult to establish a sense of 'community' in the group, especially as people multitask and will not be active for multiple days in a row.
- A lot of the nice ideas on the 'Tips and Trick' document don't work as well for a multidisciplinary/ multisectoral group of participants as we had (asynchronous content, social activities, getting that active, workshop mindset), because there is no sense of community yet, people don't speak the same 'language' and you need to bridge that first, while the participants may not even be fully dedicated to the workshop and doing other things at the same time.

Lorentz Center (virtual) Support

Comments/points for improvement for the Lorentz Center team.
Some of the procedures provided by Lorentz Center did not seem tailored to online workshops, e.g.: participants were still asked for hotel/flight arrangements when signing up, there were little recommendations for online tools to use (this is understandable as we all had to adapt to Covid-19, but should be smoothed out soon). It would be nice to have a list of checkpoints and very specific recommendations for online workshops to guide organisers.
Small detail: there were typos in the PDF programme distributed to participants, which also didn't have the nice visual identity of the poster.

Shaaron Leverment (Bristol, United Kingdom)
Kevin Ramirez (London, United Kingdom)
Pedro Russo (Leiden, the Netherlands)
Michelle Willebrands (Leiden, the Netherlands)

Nanomaterial Formation at Fluid-Fluid Interfaces

2 - 6 November 2020 @online

Short description of the aims for the virtual meeting

Most successful methods for synthesis and assembly of nanomaterials involve a fluid-fluid interface. The aim of this workshop was to bring experts from a diverse range of disciplines together to discuss the role of fluid-fluid interfaces in nanomaterials formation, methods to explore and understand such systems, and their potentials in the industrialization of nanomaterials.

Short summary of key moments (key debates, breakthroughs, etc.)

Because of the nature of workshop topic, the selected lectures were from teams that were rather disconnected, and rather unaware of the underlying shared fluid interface aspect. Several participants have mentioned that they had several moment of wow looking to some of the achievements of teams in other disciplines.

Outcome(s)

By highlighting the potentials of nanomaterial formation on fluid interfaces (evident from the lectures and discussion), it is expected that many of the participants may commit (part of) their research to this branch of science in the future.

Other than inspiration for new future individual projects, the following potential collaborations have been foreseen:

- Heather Allen and Bridget Murphy on advanced optical spectroscopy methods at fluid-fluid interfaces.
- Irene Groot and Sarah Haigh on in situ TEM experiments on catalysts.
- LMCat's theoretical collaborator (TU Munich) with multiple other experimentalists present in the workshop, including Bridget Murphy and Robert Dryfe.

Duration of the workshop and time management

We had participants from times zones virtually all around the world (Europe, Middle East, Far East, Australia, Hawaii, and US east coast). To avoid fatigue of a virtual meeting and ease of participation for different time zones, we allocated 4 sessions per day at 09:00–10:00, 13:00–14:00, 18:00–19:00, and 21:00–22:00 CET. However, mostly participants from Europe to Middle East could be actively present for the majority of sessions. Unfortunately, most key participants were present only for their own lecture (even if other lectures were given at decent times in their time zones). The participation of faculty members in the group discussion sessions were also scares.

Despite the fact that the participants were supposed to free their week for the physical meeting before the pandemic, we noticed that the time of many participants, especially the faculty members, were mostly blocked by other appointments during the online workshop. We recorded the lectures in order to make them available for the absent participants. It is unknown how many times they have been downloaded. Nevertheless there were a couple of faculty members (mostly based in Europe) who

actively joined most of the lectures and discussions. The average number of participants was 17.3 and 14 people for in lectures and discussions respectively (including organizers and LC support staff). The total number of registered participants were 40.

Short- and long-term plans for follow-up

We suggested the participants to consider applying for LC workshop for related topics. Especially, it would be great if we can organizing a follow up physical meeting on the topic, once the situation allows.

Lessons learned for future virtual events

It might be beneficial to assign the speakers to also chair the lectures of other speakers, in order to increase their presence in the workshop.

It might also be beneficial to think of an alternative session topic in case a speaker does not show up (it happened once in our case).

To our knowledge, the number of non-plenary discussions (organized by participants themselves) were only one. However, we found the poster session rather successful and significant amount of individual discussions happened during that one hour.

Comments/points for improvement for the Lorentz Center team.

Fortunately, we did not get into specific problems, thanks to the LC staff's timely preparations and effective presence during the workshop. However, we wonder whether such specific workshops as those of the Lorentz Center with its specific aims are suitable as online meetings.

Mehdi Saedi (Leiden, the Netherlands, currently located in Tehran, Iran)
Irene Groot (Leiden, the Netherlands)
Maciej Jankowski (Grenoble, France)

Modelling Social Complexity in Argumentation

16 - 18 November 2020 @online

Short description of the aims for the virtual meeting

Argumentation plays a major role in how people learn from others and persuade others, as we discuss the issues of the day with friends and colleagues, read analyses of current situations from journalists and pundits, and engage with other people on social media. Different domains have studied people's reasoning with arguments empirically, such as cognitive science, rhetoric, and persuasion. Most of this research has neglected the social context in which persuasion takes place. However, argumentation and reasoning primarily takes place in social spaces. For this reason, it is important to understand how individual-oriented models of argumentation scale up when implemented in social dynamics. Agent-based modelling (ABM) is a technique ideally placed to pursue this type of question in the argumentation discipline. Given the relatively new expansion of ABM application in argumentation, the workshop provides an opportunity to learn about computational approaches to argumentation that are directly implementable in ABMs and to test these with novel methods. More broadly, the workshop aims to foster collaborative work between the argumentation and ABM communities and to exchange ideas and methods, and it is intended as a first step towards the creation of more structured collaborations between different communities.

Short summary of key moments (key debates, breakthroughs, etc.)

Overall, the members' presence and participation during the workshop was excellent. While we initially worried the digital nature (due to the pandemic) would dissuade engagement, participants were very eager to learn from each other, to overcome disciplinary boundaries and to break new ground together. The keynotes were especially appreciated by all the participants, and they were followed by lively and engaging debates. The group work was also engaging and during the final discussion several people mentioned that this workshop was the starting of a new community, and the organizers already planned follow-ups.

Outcome(s)

The workshop had three main outcomes. First, an online repository of members' work, interests and contacts was set up, thus creating a first virtual community. Second, workshop participants were invited to submit an abstract for a special issue proposal to be submitted to an international journal. Finally, the organizers offered to setup two more online events during 2021, with the aim of supporting the community and making it grow.

Preparation

Our original workplan was converted to an online environment: we reduced the number of days, and reorganized the interaction between members in form of subgroups with a concrete task.

Duration of the workshop and time management

Three days from 10:00 to 17:00: 3 keynotes, 2 workshops, 4 group sessions, and three general discussion sessions to close each day.

Short- and long-term plans for follow-ups

We are gauging interest in a potential special issue of Argument and Computation with a submission deadline the 1st of July 2021. We are planning to host online one-day events in 2021 along the same line as the workshop - these would be focussed either on practical workshops or on presenting work for each other. Finally, we will set up a Slack channel to build an online community.

Lessons learned for future virtual events

The break each day between 12:30-14:00 was much appreciated. Small group sessions worked very well, with the same group members and a concrete task for three days.

Lorentz Center (virtual) Support

The Lorentz Center has been very helpful and flexible in converting our original workshop to an online one.

Francesca Giardini (University of Groningen, the Netherlands)
Jos Hornikx (Radboud University Nijmegen, the Netherlands)
Jens Madsen (London School of Economics, UK)

Hypergeometry, Integrability and Lie Theory

7 - 11 December 2020 @online

Scientific aim

From the research proposal, we cite parts of section on the goals of the workshop:

"The goal of the workshop is o bring together experts in the areas and directions described above for "cross-fertilization", since we see this as necessary in order to make progress on the scientific goals. This workshop will be considered as a success if we will achieve the effective working communications between research directions at all levels: graduate students, postdocs, senior researchers. We will encourage both vertical interaction, i.e. between participants of different levels of seniority, as well as horizontal interaction. This interaction will be facilitated by the written documents prepared by the moderators for each day and by the concluding sessions on open problems each day which will be moderated. We hope that the interaction will lead to further collaboration between various researchers of different backgrounds. We consider this as a sign of success on a longer term. Similarly, we consider a follow-up workshop in one or two years after this workshop also as a sign of success. We furthermore stress that in particular we want to bring young researchers in this field in touch with each other as well as with other experts."

Originally planned as a classic (live) meeting, we had to reschedule and reinvent some methods. Bringing together experts has worked out very well, since, due to the online version, we could accommodate more participants, including more PhD-students! Form the reactions it is clear that the content and its impact was actually bigger than in a classical meeting. The line-up of speakers was excellent, and the lectures led to long discussions. However, most of the discussions took place in a plenary situation. The more personal interaction between a few participants was probably less (as far as we could see). We do know that the lectures led to (email) interaction between a few participants, but we don't have a clear overview. Personally, we view most of the talks as well as the following discussion session as inspirational.

The idea of moderators introducing the topic of the day, giving a short introduction and moderating the discussion was a great success. We feel that the moderators did a great job, and we feel that this format is very well suited for online meetings centred around a few topics. In our opinion this set-up led to key-moments in the meeting.

There will be at least two follow-ups on this meeting. Firstly, the organisers   assisted by two participants, Bart Vlaar and Stefan Kolb, will edit the conference proceedings, to be published in the American Mathematical Society series Contemporary Mathematics. Secondly, plans for a follow-up meeting in 2021-2 are under way. Both plans have been discussed in the final meeting, and received a lot of support from the participants.

The online meeting didn't work very well to increase the interaction of younger participants among each other and younger participants with more senior participants. Although we used apps for social interaction, this did not work out well. This was partly due to the fact that the poster session in the online world did not work out very well.

Organization

Due the change of plans from a live to an online workshop, we had to improvise. Due to the geographic background of the participants (mostly European and American), we changed to time to afternoons and evenings (CET), so that all activities could take place "live". This benefitted the discussion session, which took place "live".

The time schedule essentially followed the original plan (except for the shift to afternoon and evening). We used wonder as a social app, but as far as we can see this has been used infrequently.

We have not recorded lectures, but all lecturers have made their slides available to all the participants.

There are many platforms for online meetings, and MS Teams is not the most preferred one in the mathematics and physics community. This led to some annoyance among some participants, but the help of Bart Vlaar and Hadewijch De Clercq in these matters was very useful. (Only after the meeting we learned of one participant who was not able to log in, and missed it completely.)

Lorentz Center (virtual) Support

We very much appreciate the support of the Lorentz Center, also during the preparation of the application. Before and during the workshop the support in all practical issues by Tanja Uitbeijerse and Michelle Grandia is much appreciated.

An improvement for virtual support is to widen in the scope of supported platforms for the workshops, such as e.g. zoom.

It would be great if the lessons learned from the virtual meetings could be used in the future to see how the live meetings can be extended to allow for a broader scope in participants (and impact).

Erik Koelink (Nijmegen, The Netherlands)
Nicolai Reshetikhin (Berkeley, CA, USA)

Robust Artificial Intelligence

11 - 14 January 2021 @online

Workshop aim

Artificial Intelligence (AI) is now part of everyday life and industry is increasingly exploring the next generation of products it could enable. As its adoption continues to grow, AI will increasingly be embedded in safety-critical applications (e.g. healthcare, transportation). But is AI trustworthy? What challenges arise for it to be used in safety critical products? Academic and industrial AI practitioners agree that one of these challenges is the verification that AI models perform as intended i.e., be robust against unexpected or adversarial perturbations. The assessment of AI Robustness was placed at the core of the workshop. Experts in the two research branches of AI robustness were invited: empirical approaches and formal methods for neural network (NN) verification.

Organisers/participants

The RobustAI workshop was organized by Airbus AI Research in collaboration with TNO. It was a virtual event, scheduled from 4-8pm (CET time) to accommodate its multi-national audience (40 participants) composed of industrials (Airbus, Audi, NLR), regulatory authorities (EASA), law representatives and experts in European law (Free University Brussels) and a diverse scientific community including experts in empirical and formal methods applied to NN verification.

Format

Day 1 was dedicated to industrial and regulatory bodies with live talks and a panel discussion presenting current industrial challenges to academics. Jan12-13 focused on technical topics: empirical approaches (day 1) and formal methods (day 2) applied to A.I. Two state-of-the-art and ~20 talks were pre-recorded (Dec). Participants sent questions collected early Jan. During the workshop, the speakers were invited to answer questions in a 1hr-Q&A session. The Q&A was followed by a panel discussion led by experts and break-out sessions where smaller groups of participants were invited to brainstorm on topics relevant to the day. A slot of 45 minutes was then dedicated to AI library tutorials. The fourth day was devoted to feedback from attendees and exploring future collaborations.

Outcomes

It will take some months to debrief the rich (and fortunately recorded) scientific content that the workshop generated. The academics were interested in being presented with the challenges of real-life applications and a whole picture of embarked systems. Industrial contributors were strongly encouraged to provide academics with more use cases linked to real safety robustness analysis. It was also agreed that the diversity of attendance would be beneficial also for workshops in conferences.

Scientific dissemination

Pre-recorded videos and their recorded Q&A sessions are available online on the RobustAI website (https://sites.google.com/view/robustai-lorentzcenterworkshop). The website also makes available a best-of the 3x2hr panel discussions. This represents a gold mine of information for the AI robustness research community for years to come. Participants are invited to disseminate the workshop outcomes via their own network (simultaneously advertising the Lorentz Center).

Participants feedback

The enthusiasm of the participants could already be felt ahead of the event. Attendees provided constructive suggestions on the programme, committed to provide recorded talks and visualize them ahead of the meeting (during the Christmas break!). From the feedback we received so far, we can already assess that the workshop was a success. Participants particularly appreciated the diversity and complementarity of the attendees (not provided by conferences in the domain), the guided discussion panels as well as the break-out sessions when everyone had an opportunity to contribute. Most of the participants reported that they would have liked to have more time during the group sessions. It was difficult to have more time in the schedule because of the limited duration of the workshop but it clearly shows that a live workshop would be even more beneficial (for those who could attend). Some participants however admitted they would rather attend an online event, not a physical one (because of availability, travel restrictions etc.)

Jayant Sen Gupta (Toulouse, France)
Audrey Galametz (Taufkirchen Germany)
Mélanie Ducoffe (Toulouse, France)
Joseph Nagel (Munich, Germany)
Babette Bakker (The Hague, The Netherlands)
Joris Sijs (The Hague, The Netherlands)

Improving Forensic Trace Recovery

1 - 5 February 2021 @online

Scientific

The aim of the workshop was to lay the groundwork for a scientifically sound, generic, homogeneous, and efficient methodology of forensic trace recovery.

Current forensic methods have an incredible sensitivity. Minute traces, often invisible to the bare eye, allow for a full analysis. Only a few cells yield a full DNA profile; a single fibre suffices to identify the fibre type as well as the dyes used for its coloration; the elemental composition of glass shards smaller than 100μm is now analysed on a routine basis in forensic laboratories.

However, before a forensic expert can examine a trace, it needs to be recovered. Unfortunately, the procedures for recovery of traces are heterogeneous: experts in different forensic disciplines and in different laboratories use different methods. Sometimes, such methods are not compatible, and recovery of one type of trace may destroy other traces. Heterogeneity also hinders scientific studies into the behaviour of traces, accreditation of new technology, and international cooperation.

The workshop participants held a series of small group discussions on the themes of comparing recovery procedures, exploring quality systems and judicial systems, future collaborations and R&D, and considerations for drafting a generic trace recovery procedure. Progress was made, however it was also recognised at the outset that this ambitious, cross-discipline effort would require further work, probably in the form of a follow-on workshop.

One of the key outcomes of the meeting is a general consensus that there was a need for further discussions and work towards harmonizing trace evidence recovery methods, and that no known existing entity was already doing work to this end. This echoed the sentiments of the organizing committee.

Discussions on the techniques to recover traces formed a small part of the workshop. A large part was committed to the motivation to recover a specific trace. This was not foreseen by the workshop committee, but forms a welcome addition. On several occasions we found that the motivation discussion is similar for crime scene investigations and laboratory based investigations.

Participants were from police and forensic services of several European Member States, as well as from USA, Canada and Australia and additional European countries. Out of 81 persons invited to the workshop, 67 persons registered and attended.

Duration of the workshop and time management

The workshop program was scaled down from a week-long in-person event to a three half-day online event due to the pandemic. It was anticipated that five full days online would be unrealistic and unproductive for the participants.

As an input to the workshop small group discussions, participants were asked to complete survey questions on the following topics before the workshop start:

- General Information on participants
- Exploring Trace Recovery Procedures
- Exploring Quality Systems
- Exploring Judicial Systems

The Workshop Organisation Committee agreed on a format of three afternoons, Monday, Tuesday and Friday, focused on discussion groups and the live presentation of new technologies, with the support of a series of a dozen pre-recorded lectures to be viewed by participants beforehand, to inform the discussions. A pause was created between Tuesday and Friday sessions, to allow reflection and maturation of ideas before final discussion groups.

Short- and long-term plans for follow-up

In the short term, it is planned to compile a summary of the outcomes of the discussions and to provide them to the participants. The longer-term follow-up involves the planning of a second workshop and/or additional online working sessions to continue the discussions and drafting of a generic trace recovery methodology.

Lessons learned for future virtual events

One of the biggest challenges for the organizational committee was timing. The decision to move to a virtual platform was only made in December, which did not leave us with much time to redesign the program, and to give new instructions to the speakers, whose topics changed slightly to accommodate the shorter program, and who had to provide us with a pre-recorded talk.
Ideally, the speakers would have had a little more time to prepare their talks, and perhaps also a joint online meeting to improve synergy between the presentations. The program also did not have room for discussions about the specific talks, which was critiqued by some of the participants.
The breakout sessions of 5-6 people were by far the most productive part of the workshop, and provided a good boost of increased interaction between the more passive plenary sessions.

Comments/points for improvement for the Lorentz Center team.

Should a workshop be organized by an entity without an existing online platform (SHUTTLE in our case), it could be useful for Lorentz to make available an online tool for organizing meetings and space for sharing document drafts online much earlier in the planning process.

Jaap van der Weerd (Netherlands Forensic Institute, Netherlands)
Iris Bijker (Amsterdam University of Applied Sciences, Netherlands)
Rebecca Bucht (National Bureau of Investigation, Finnish Police, Finland)
Jan Grunwald (Bayerisches Landeskriminalamt, Germany)
Bas Kokshoorn (Netherlands Forensic Institute, Netherlands)

Towards a One Health Approach to Study Leprosy

8 - 11 February 2021 @online

- 49 participants from 14 different countries
- 4 day, 3,5 hour per day, online Teams workshop

Goals of the workshop

1. Stimulating of interdisciplinary collaboration in scientific studies regarding leprosy.
2. Discussing evolutionary patterns and possible transmission pathways of M. leprae through combining and comparing presented data on the presence of M. leprae in humans, animals and the environment.
3. Evaluating and developing One Health based research strategies and disease mapping strategies, bridging thus far, non-overlapping research domains.

Themes of the workshop

a. Paleopathology and History
b. Modern and ancient genomics
c. Transmission: Immunological and Epidemiological perspectives
d. Zoonosis and One Health
e. Wild life reservoirs and One Health

Identified research challenges

1. International comparative research asks for standardized reporting and the establishment of criteria that are transferable between the different disciplines involved in leprosy research
2. International standardization of genetic/genomics methods by developing appropriate definitions and sample criteria should help to overcome sampling and sequencing bias.
3. International exchange of unpublished data (raw sequencing data or negative results) and stored laboratory samples should be stimulated across disciplines.
4. There is a need for more scientific evidence for the contribution of the environment as a source for transmission of M. leprae.

Identified research opportunities

1. Stimulate interdisciplinary collaborations between paleopathologists, historians, geneticists, immunologists, epidemiologists, clinicians, veterinarians, and leprosy field experts through establishment of a Leprosy One Health Consortium.
2. Enlarge the scope of individual projects with hypothesis driven transdisciplinary intrnational projects which combine One Health related issues including but not restricted to environmental shedding and contamination, animal reservoirs/animal vectors, socioeconomic issues like poor housing and nutritional status and anthropological aspects of stigma and rituals.

Toine Pieters (Utrecht, The Netherlands)
Annemieke Geluk (Leiden, The Netherlands)
Verena Schuenemann (Zurich, Switzerland)

Useful Quantum Computing for Quantum Chemistry

22 - 26 February 2021 @online

Aim of the meeting

- Bring together fields of quantum computing and quantum chemistry.
- Determine which classes of problems in chemistry are most promising for quantum-assisted solutions.
- Estimate the gap between current state-of-the-art quantum hardware performance and requirements for useful quantum simulations of molecular systems.
- Further the integration of quantum computers in quantum chemistry codes, either as embedded subroutines or hybrid quantum-classical schemes.

Key moments

The talks in the workshop provided a consistent high-quality presentation of recent work in the field from leading experts - it is difficult to pinpoint particular 'breakthroughs' here, but the overview on what is going on in the field was complete and hence a perfect basis for the discussions.

The discussion sessions produced interesting ideas of providing an independent set of chemistry benchmarks / a hackathon for quantum computing teams to work on chemistry problems each year to assess the state of the field. They also identified the need for easy-to-access literature on fault-tolerance (the current body of literature is far from easy to access).

Outcome(s)

In practice, the workshop became far more like a mini-conference; the keynote talks were attended by 50-70 people each day, and discussion sessions and focus talks were attended by 20-30 (as opposed to the original plan with max 20 attendees). The impact of the workshop has been furthered by the addition of the YouTube channel (www.youtube.com/channel/UCsQHom4pSfPnjfiuK_Zrufg/featured) with now over 100 subscribers and almost 2000 views. This helped disseminate many ideas that are known within the field but perhaps not as well-known as they should be, for example:

- That error mitigation could be additionally useful within the fault-tolerant era
- That NISQ quantum chemistry algorithms are severely limited by circuit depth and shot noise, to the point where we do not think the electronic structure problem will be solved for beyond-classical problems in NISQ.
- That fault-tolerant algorithms will require significant classical overhead e.g. to calculate integrals and do factorizations of two-body operators.
- That fault-tolerant algorithms require completely different cost models to NISQ.
- That classical chemistry algorithms are coming near to tackling many of the problems currently suggested as being 'early targets' for quantum computing.

In this sense the workshop was a moderate success, however as the discussion part of the workshop (both during discussion sessions, during questions after talks, and during breaks) was very limited by participants having other work, it did not function at all like originally intended.

Preparation

The most part of the work was put into organising the timetable, ensuring that it was well-advertised, and ensuring that speakers knew when they were presenting. Also the sudden switch to a virtual discussion session required some extra engagement with the speakers.

Duration of the workshop and time management

Workshop lasted for 1 week, roughly 5-6 hours a day of activities.

Short- and long-term plans for follow-ups

The youtube channel remains up and is continuing to gain a large amount of interest.

Lessons learned for future virtual events

Offer less, not more.
Discussion sessions are very difficult to arrange virtually.
Youtube channel was a great way to show off those talks that were at a less convenient time than the keynote sessions.

Comments/points for improvement for the Lorentz Center team.

- The display of the timetable on the website needs improvement for a virtual workshop (as for a virtual workshop the timetable is the number one thing people attempt to visit). We had issues updating the timetable over the course of the week as this changed the url link, and the link to the timetable was not displayed clearly on the front page of the workshop.
- We also had to format the timetable entirely by ourselves to clearly display different sessions, and give information for different timezones. This was a considerable effort on the behalf of the organisers, and would have been done better by the Lorentz team.

Thomas O'Brien (Munich, Germany)
Lucas Visscher (Amsterdam, Netherlands)
Barbara Terhal (Delft, Netherlands)
Markus Reiher (Zurich, Switzerland)

Lorentz
center

The Enigmatic Role of Mergers in Galaxy Evolution

8 - 12 March 2021 @online

Aim of the meeting

Galaxy mergers are a crucial physical process in galaxy formation and evolution. The overall aim of the virtual meeting was to bring together the various topics in the study of merging galaxies, in the context of ever-increasing data volumes and emerging new techniques and simulations. We set out three specific themes, merger identification, impact on star formation and the interstellar medium, and impact on AGN triggering and feedback. We heard many exciting talks on the latest development in the three themes covered by this meeting. The plenary discussions were particularly useful in bringing out the important issues and questions in this field. Under each scientific theme, we have purposefully interspaced presentations by scientists working on different areas (observations of nearby and distant galaxies, simulations, theory) to allow more effective interactions between the various sub-communities. A few outcomes include: 1. Better understanding of the level of reliability needed for merger detection; 2. Better understanding of the importance of integrating observations and simulations in merger studies; 3. Better understanding of the importance of selection effects in driving differences in conclusions.

Preparation

We had a number of meetings with the Lorentz Centre staff to sort out various issues related to the practical side of running a meeting such as online platform, registrations, timetable, and technical support. We also had a few Zoom meetings amongst the scientific organisers to select participants and abstracts, design a detailed programme, organise the plenary and parallel sessions, etc. Several test sessions to learn about the MS Teams software were also organized by the Lorentz Centre, which were very helpful in ensuring the smooth running of the meeting. Unfortunately, it was difficult to make sure every participant to take part in these test sessions and we did have a few technical problems during the meeting (see below).

Duration of the workshop and time management

The duration of the workshop is a full week. To deal with the different time zones, we restricted the workshop to take place every day between 3 and 8 pm (CET), with a 1-hour pause. At the start of each session, we first had plenary presentations to set the stage for the subsequent discussions. In traditional Lorentz Centre workshop style, we also had plenty of plenary and parallel discussion sessions. Based on our impression, the plenary sessions are very lively and successful. The chat function was also important in allowing multi-direction conversions and allowing people (particularly junior scientists) to speak up. The parallel sessions were a bit hit and miss, which was somewhat expected. The general experience of virtual conferences during COVID is that emulating live interactions is extremely difficult.

Short- and long-term plans for follow-up

Our longer-term plan is to follow up with a larger conference in a few years to review the progress made, particularly after the launch of ESA's Euclid mission which is expected to have a big impact on the study of mergers. Shorter term plans are still unclear but may include work visits among the scientific organisers and participants as well as a detailed comparison study on various merger detection techniques (which was originally planned for an on-site meeting).

Lessons learned for future virtual events

Our original intention was to include a large group of people to be more able to represent the community. However, the widely different time zones made the organisation more difficult; participants in Australia/Asia were particularly compromised. There was a lack of technical support outside the working hours in the Netherlands. Also, some participants were unable to stay for the whole duration of the workshop. Recording the meeting would have been a good option for people who had to miss parts of the meeting, but due to issues with consent forms this was not possible in the end. It was difficult to make every breakout group work during the parallel discussion sessions. Even though we stressed time and again that the breakout groups should be roughly similar in size, in practice it is difficult to force people to go to a specific group, especially for an online meeting. Possibly we could try to impose a limit on the number of participants in each group, but we would then risk losing some people altogether. MS Teams also had some function that mimics social interaction in an online environment. However, based on our experience, it was not used much during our meeting. Gather Town or Zoom might be a better software for integrating meetings, breakout rooms, and social areas.

LORENTZ CENTER (VIRTUAL) SUPPORT

Given the constraints imposed by COVID, the workshop took place online and it was largely successful. We also received positive feedback from many participants. The main difficulty was MS Teams as a number of participants experienced problems. It was also a bit confusing with starting various rooms for plenary discussions and parallel discussions. In our experience, Zoom is much easier and more intuitive to use. Due to the different time zones, part of the workshop took place outside the working hours in the Netherlands. Therefore, technical support had to fell on the scientific organisers. One of the benefits of in-person Lorentz Centre meetings is the local support, so that everyone (including organisers) can focus on the meeting itself. This was not the case for us – the organizers spent a lot of time managing technical issues (even when there were no problems per se, we had to set up rooms, manage the chat function etc) which definitely compromised the meeting engagement for us. A final point is that we had a hiccup with the consent forms before the meeting started which was too late to be corrected. As a result, we could not record the presentations and discussions.

Lingyu Wang (Groningen, Netherlands)
Sara Ellison (Victoria, Canada)
Marc Huertas-Company (La Laguna, Spain)
Christopher Conselice (Manchester, UK)

Autonomous Behaviour in Living and Robotic Matter

23 - 24 April 2020, 9 - 11 March 2021 @online

Emergent materials have properties and behaviours that result from the local and collective interactions between their building blocks, often vastly exceeding those of individual building blocks. Recently, there has been an upsurge of interest from a range of disciplines, including physics, chemistry, material science, engineering, robotics, and architecture, for both living and artificial materials featuring shape-morphing, adaptive, self-oscillating, and self-learning behaviour. All these striking properties stem from the out-of-equilibrium interactions and feedback between the building blocks, mediated via chemical signalling, nonlinear mechanical coupling or electronic communication.

The aim of the workshop was to bring together experts from designer, living and robotic matter, in order to obtain a cross-fertilization between these fields. The rich behaviour observed in living matter can inspire advances in designer and robotic matter, and vice-versa designer and robotic matter could function as testing platform to identify the key ingredients for autonomous emergent behaviour in living matter. Stronger interactions between these fields will significantly boost our ability to explore new topics of autonomous emergent behaviour, such as self-folding, self-oscillations, self-organization, adaptation and learning.

While originally the workshop was planned to be held in person, due to Covid-19 we were unfortunately not able to meet in person. Instead, we held an initial 2-day 2-hour Zoom session in April 2020 to already introduce the participants and their research to each other, and to have a brainstorm about the possible topics that we could cover during a next meeting. The next meeting, which was also still held during the Covid-19 pandemic, we decided to use the online platform *gather.town*. Our aim here was to bring back some much-needed social interaction, and to be able to communicate and talk science within smaller groups, in the hope to be able to foster new connections between the different fields. The format of the research (which lasted 3 days, 3-4 hours each) was received very positively, and ensured that discussions between the different participants up to about 6 persons. In these groups new ideas were generated, and especially a familiarity was created between the goals and research questions that are encountered in the different fields.

Of course, the initial goals and plans set out for an in-person workshop were not completely met, mostly due to the limited time of the online meetings (which definitely has a large effect on the presence and activity of participants). However, given these difficult times, we as organizers were very happy with the positive feedback and the new connections and inspiration that results by bringing the various fields of research together.

Karen Alim (Göttingen & München, Germany)
Corentin Coulais (Amsterdam, Netherlands)
Bas Overvelde (Amsterdam, Netherlands)

Bringing Stellar Evolution and Feedback Together
15 - 19 March 2021 @online

Summary

The workshop "Bringing Stellar Evolution and Feedback Together" was scheduled for 15-19th March 2021 as a Lorentz Center workshop. Due to covid travel restrictions, the in-person workshop was postponed provisionally to 2022, and a shorter 2 half-day online workshop was held on 15th-16th March.

The workshop comprised of 8 talks and 2 breakout sessions via Zoom over the 2 days. Attendees were encouraged to interact via a workshop Slack, and to extend talk discussions on this platform to limit "Zoom burnout" and allow attendees from different time zones a chance to interact asynchronously. A hangout space on wonder.me was also created to facilitate discussions outside the sessions.

The online workshop was successful in its aims of initiating contact between the two fields of Stellar Evolution (how stars are born, evolve and die) and Stellar Feedback (i.e. the action of stars in shaping the gas in space through winds, radiation and supernovae). Additionally, it had the benefit of connecting groups working in those fields that do not commonly interact, e.g. researchers on feedback around young stars, and researchers studying feedback on a galactic scale. The task for the future is to build on this groundwork to create concrete collaborative projects and allow deeper interactions than allowed by an online platform.

Attendance

52 people were registered for the workshop via the Lorentz Center website. This does not include a small number of informal attendees provided links by their group leaders at the last minute. Approximately 45 people were on the Zoom call at its peak on Day 1, and 35 on Day 2, although these numbers fluctuated. One attendee apologised that they had an organisational commitment on Day 2 but followed the discussions on Slack. Attendees from North America and Asia also participated, despite the time zone differences. The wonder.me sessions had roughly 16 people on the first Day, 3 people at the coffee session on Day 2 and roughly 6 people on Day 2.

The low barrier to entry was a positive aspect. Simultaneously, it allowed people to mix other work commitments. The asynchronous nature of the meeting, with recorded talks and breakout room summaries, meant that people could catch up with the meeting content in their own time.

Engagement

In addition to the 8 invited talks, 6 posters and 3 contributed talks were posted to the Slack. These received some limited discussion in the channel. Slack also allows "emoji" reactions, and sometimes people did not ask questions but instead responded with an emoji (e.g. a star or galaxy image). Future online events should consider how to improve engagement in this respect, and how it can provide value to young researchers who cannot currently go to conferences to promote their work in person.

The Slack was active during the meeting, with more questions and discussions on it than via Zoom. This was partly by design, with the Zoom sessions kept short and to-time. There were 5 total breakout rooms over the 2 days on topics suggested by attendees. The discussions were active and wide-ranging. Sometimes the breakouts focussed on specific technical problems (e.g. where do the high energy photons from stars go?) and sometimes on a wider problem (e.g. how does small-scale stellar feedback affect larger scales like galaxies or intergalactic space?)

Some of the attendees used the Slack space to hold longer discussions linking the two fields. Discussions typically ended after the Zoom part of the workshop was concluded, though. This may be attributed to the fact that an online workshop does not have the sole attention of attendees, or that

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initiating collaborations without a more specific focus is more difficult online versus in-person, where coffee and lunch provides a natural physical focus for interaction.

SWOT Analysis

Strengths
The workshop was successful in its core aim of connecting two communities and promoting discussions between them on where they can help each other.

The shorter Zoom sessions worked well, and did not overburden people. The use of 5 minute breaks between each talk helped keep the meeting to time and provide an outlet to people wanting time away from the screen.

The Slack was well-used between sessions, and allowed a place for posting material such as talks and posters. It also allows a natural way for attendees to contact each other.
1. Multitasking organisational tasks and attending the workshop is easier in a virtual format. The shorter online format also meant less time and energy was needed to organise it.

Weaknesses
2. Other than the invited talks, there was not a great deal of engagement with contributed talks and posters. Future meetings should think about how to improve this kind of engagement and provide value to junior researchers in promoting their work. One attendee was not sure if they were allowed to produce a talk/poster for it without an invitation or applying to do so.
3. People do not typically have the energy to engage with the online format beyond the "official" program of the meeting, whereas in-person workshops naturally have social times at coffee, lunch and in the evening.

Opportunities
4. The workshop provides evidence that short events like this have value in connecting an international audience with much lower barriers to entry than travelling in person.
5. The cost of organising such a workshop is also lower, and people with mobility, family or funding constraints have less or no barrier to attendance.

Threats
6. The online aspect means that people tend to skip sessions for other commitments, which is less the case for in-person events.
7. If travel restrictions continue for much longer, these workshops will have to become the norm rather than being stop-gaps before in-person events. The above weaknesses will thus become more important to solve.

Sam Geen (University of Amsterdam)
Zsolt Keszthelyi (University of Amsterdam)
Alex de Koter (University of Amsterdam)
Freeke van de Voort (Cardiff University)

Explainable Medical AI
Ethics, Epistemology, and Formal Methods
12 - 16 April 2021 @online

Aims for the virtual meeting

This workshop addressed the formal, ethical, and epistemological, questions that the development of the medical AI calls for, such as: Are the new formal black-box methods successful in offering suitable explanations? What does explanation mean in this context, and what functions does it fulfill? Should a right to explanation really exist in the context of medicine, and how should we strike the balance with possibly improved accuracy? What is in fact the current contribution of AI to medicine, and how vital is it?
In discussing these and related questions, our workshop merged the normative elements regarding explanation with the epistemological and formal elements so that we can establish a better understanding of future medical AI, and hopefully improve it.

Key moments (key debates, breakthroughs, etc.)

There was a good mixture of positive and negative arguments towards medical AI. Some speakers argued that medical AI was being overestimated, because it was either not as new as it appears, or because there were still many practical obstacles doctors faced when using it. Others shared some of the skepticism, but took a cautiously optimistic approach and used symbolic reasoning to improve the quality and trustworthiness of AI. The keynote talks explored the more fundamental and conceptual issues that still need to be addressed before medical AI can be a success. Of particular interest was the patient interview, which connected the theoretical discussions to the lived and concrete experience of people being affected by the use of medical AI.

Outcome(s)

We learned that it is not easy to bridge the gap between the normative and descriptive side of the problem. Few researchers are qualified to bridge this gap and have authority in both communities. Yet, researchers learned a lot from getting an insight into how other (sub)fields looked at the problem, and thus this kind of interdisciplinary dialogue turned out to be extremely fruitful. Overall, there seemed to have been a shared critical view on the quality of their performance and the possibility of replacing doctors with those systems, but also a shared ambition to improve many of the existing shortcomings.

Organization

Preparation was largely overtaken by Lorentz-Center: From our experience and the feedback of our participants, the organization was smooth and without any major technical or administrative issues.

Duration of the workshop and time management

It was crucial to shorten the originally planned on-site five-day workshop to three days when moving online. It was still difficult to ensure that all participants were present during three consecutive days. Various researchers joined only those sessions in which they had to present, meaning that there was less interdisciplinary interaction than there could have been. We had no time left for the wrap-ups of the day, but this wasn't a big loss.

Short- and long-term plans for follow-up

Three of the organizers (Karin, Juan, Martin) are working on a Special Issue in Ethics and Information Technology, where several participants of the workshop will be involved as authors or reviewers. The organizers aim to continue collaborating on this topic.

Lessons learned for future virtual events

To further the engagement of all participants throughout the three days, we should have developed a design that gives them a more active role: rather than simply having a speaker and an audience, we could have used intermediary roles such as commentator, moderator, debater, etc. This would also have helped to mix the ethical with the formal/epistemological part, forcing all participants to engage in discussions with which they are unfamiliar.

Lorentz Center (virtual) Support

We have received great support both before and during the virtual workshop by the Lorentz Center Team. All minor technical problems were quickly resolved by the team

Juan M. Durán (Delft, the Netherlands)
Sander Beckers (Muenchen, Germany
Karin Jongsma (Utrecht, the Netherlands)
Giuseppe Primiero (Milan, Italy
Martin Sand (Delft, the Netherlands)

Watching Chemistry Happen

13 - 15 April 2021 @online

Scientific

Simulating the fundamental reactivity of molecules, in particular after photo-excitation, requires solution of the time-dependent Schrödinger equation with the nuclei treated as quantum particles. These quantum dynamics simulations are, however, technically and computationally challenging. The workshop brought together chemists, mathematicians and physicists with the aim to make the separate communities aware that we are often looking at different aspects of the same problem, and to set common grounds for future progress. A set of topics was discussed that represent the difficulties of present-day approaches.

The workshop was built around daily discussion sessions for all participants with a few scientific presentations to set the state-of-the-art and provide ideas. A key event was a discussion between the ECRs on the difficulties they face, which fed into a general discussion on problems to be addressed by the community.

The main outcome was the realisation that the community needs to develop and curate narratives as to what QD is and what it is able to achieve. To help researchers navigate the present "jungle of methods" it was agreed that we need (i) a set of recommendations for details to be reported in papers, including sample inputs (ii) a collection of failed methods would be useful as a guide (iii) standardisation of terms to allow easy comparison (iv) better documentation of mathematical details in codes. We discussed as well the possibility of developing infrastructure support for code development and data storage aiming to continue the tradition of the E-CAM project on Quantum dynamics which some of the participants were part of until the end of 2020 (conclusion of the E-CAM funding period).

Other research initiatives also arose between individual groups discussing particular problems, such as energy conservation in Gaussian Wavepacket calculations. It was mentioned by a number of attendees that the workshop contained a high level of useful discussion time.

Organization

The key preparation was made around the program design, taking into account suggestions from the experience of the Lorentz Centre team. It was decided to reduce the length of the workshop to 3 days, and have very few formal webinar presentations to help give adequate discussion time. All events in the "plenary" room were run as synchronous presentations and discussions, and participants were encouraged to use the breakout rooms and Wonder coffee room for small group and private discussions. The main platform was Teams, as set up for us by the Centre. We feel that other platforms could give more flexible virtual experience, and a few participants had technical issues, but it worked well enough.

We devoted the majority of synchronous time to discussion sessions actively involving all participants, with leaders selected and informed before the meeting started. A key session was constructed around the points raised during the ECR discussion (morning of the second day). The role of the discussion leaders was essential to identify discussion topics emerging during the whole duration of the meeting.

We plan to follow up the event with further workshops to extend the discussions started here on supporting the community, and move on to concrete scientific problems. These will hopefully include a future Lorentz Workshop as well as using resources known to participants.

In general the meeting went as well as it could for a virtual meeting, but face-to-face discussions would still be preferable. We have, however, learned the potential of virtual technology and can envisage a hybrid format in future to allow remote participants to take part to some degree.

Lorentz Center (virtual) Support

The level of support was excellent, with quick response and help for people with technical problems.

Graham Worth (London, UK)
Federica Agostini (Paris, France)
Benjamin Lasorne (Montpellier, France)
Caroline Lasser (Munich, Germany)
Anastasia Borschesky (Groningen, Netherlands)

Gravitational Wave Astrophysics for Early Career Scientists

3 - 7 May 2021 @online

Aims for the virtual meeting

Gravitational-wave (GW) science is pursued by a heterogenous group of people working on several different theoretical predictions, observational projects, and detection techniques all around the world. The virtual Gravitational-Wave Astrophysics for Early Career Scientists (GWÆCS) workshop set out to connect and promote a productive and healthy GW community. To this end, the workshop was designed as having a 50% / 50% split between science and community sessions, and equally a similar balance was imposed between invited talks and open discussions. Among almost 250 applicants, 80 were selected to participate in the live workshop while all others were provided with access to follow the talks and discussions offline. Attendees were selected also keeping in mind diversity in all aspects of life and academia, so as to cast a wider net and hear from as many voices and groups as possible.

Key moments (key debates, breakthroughs, etc.)

The first day kicked off with D. Kennefick's talk on the history of GWs, providing the attendees a common ground upon which to build. This was followed by J. Gair's talk on data analysis tools for GWs, many of which are common between different detectors, and a lively discussion of the state-of-the-art in the field. The rest of the day was dedicated to a well-attended social session on GatherTown, with an unconventional poster session in sub-groups, a wider mingle and virtual games.

Tuesday's first session was dedicated to Diversity, Equity and Inclusion (DEI) and was certainly a highlight of the workshop. B. Kamai's talk on DEI in astrophysics prompted a constructive discussion, where specific issues faced by minorities in the community emerged, and several ideas of how to improve DEI were proposed. A key finding is that _we need to work towards a community that acknowledges promoting DEI as part of our job as good researchers_, and not a (laudable) free time endeavour. We must set aside work hours to discuss and promote DEI, and organise and participate more in DEI talks and workshops, encouraging the members of our research groups - early and late career - to do the same. The talks of S. Shah and J. Steinlechner on DEI in the LISA and LIGO collaborations respectively provided an overview of what is currently being organised to this end. Another important point which emerged is that _we must strive to invite members of minority groups in our field to give science talks at events such as this_ and not limit our invitations to socially-centered topics, so that they may promote their science, and not burden them with the duty of explaining and defending social equity. The second half of Tuesday hosted the ground-based detector science session, with talks by L. Nuttall on LIGO/Virgo observations, and S. Bangalore on third generation detector science. These underlined the fact that we are approaching the statistical detection era of GW astronomy. A highlight of the discussion that followed was _the topic of open data, and how the community will re-organise to face the ever-growing number of detections, which scales faster than the number of analysts_.

Wednesday's first session saw a complete overview of LISA instrument and detection science, with in-depth talks from A. Petiteau, E. Rossi, and C. Caprini. The amount of potential scientific discoveries that LISA will bring about is momentous, hence the discussion focused around the detection challenges which this generation of early career scientists will face in ~15 years. In particular, _successful component separation in LISA data will determine our ability to produce meaningful science with this amazing detector_. The well-being and mental health talk by occupational therapist J. Perez followed, where the speaker provided us with detailed scientific descriptions of the causes and symptoms of

stress, how to distinguish good stress from bad stress, and what to do to get out of unhealthy mindsets and into healthy work habits. This was followed by an anonymous discussion/Q&A session via Flinga, where participants were able to post questions anonymously, vote for questions they resonated with, and ultimately also intervene to provide their view on the topics at hand. Overall, what emerged is that _there is a prevalent inability to cope with the expectations society has for us as individuals, given the structure and mechanisms of success in academia. There is also wide-spread impostor syndrome in our community, which brings us to compare each other and ourselves unfavourably_.

Thursday started with an overview of outreach activities for GWs by M. Hendry, followed by a talk on early career funding opportunities by D. Gerosa. The discussion was particularly engaging, focusing on extremely relevant topics for early careers such as how to carve out a career path and make life-changing decisions. What emerged is that _a key ingredient in a successful life in academia is achieving research independence_ from our academic advisors _and highlighting our original creative contributions to work we carry out_, especially in the wake of big collaborations. Thursday's second session was dedicated to PTA science with talks by C. Tiburzi and M. Kramer. PTAs are incredibly close to their first detection of gravitational waves, and we have our eyes peeled for updates from the various international PTA collaborations.

Friday's first session was dedicated to presenting early career groups in the community: M. Korobko introduced us to the LSC Academic Advisory Committee (LAAC); L. Haegel gave an overview of the Virgo Early Career Scientist (VECS) group; V. Korol, T. Kupfer, and R. Balasov gave an overview of the LISA Early Career Scientist (LECS) group. _The main goal of ECS groups is to share career opportunities, skills, and organise workshops just like this one_. The session and workshop closed with a round table about ECS groups, our role in the wider community, and what we expect from the future. What emerged is _the firm hope that this workshop will become a yearly event which will see a turn-over between "generations" of ECSs, and which will take the temperature of the community, making sure we continue to grow and keep everyone's ideas and interests in mind_.

Outcome(s)

Besides providing useful information for the professional and social development of early career scientists working on GWs, and a starting point to an integrated research community, the GWÆCS workshop produced two main tangible outcomes: _a legacy document_ collecting a summary of few pages of each workshop session and _the coordination of common activities_ among different early career scientists groups in the GW community (LECS, VECS, LAAC, PTA, ...).

Preparation

The organisation of the workshop took place completely online, with regular telecons among the organisers (one per one/two weeks) and support from Slack.

Duration of the workshop and time management

See the schedule; time management was no problem given the generous amount of time for discussions in the schedule. The time was chosen in the afternoon so that participants in the Americas could join too.

Short- and long-term plans for follow-up

We are writing a legacy document to be published next September.

Lessons learned for future virtual events

A one-slide poster presentation introducing yourself and your research on the first day works really well! We would keep this for future virtual events.

Comments/points for improvement for the Lorentz Center team.

Good idea to have a test session for the organizers and participants.

Organisers

Béatrice Bonga (Radboud University, Netherlands)
Tanja Hinderer (University of Amsterdam, Netherlands)
Arianna Renzini (California Institute of Technology, USA)
Lijing Shao (Peking University, China)
Nicola Tamanini (CNRS/L2IT, France)

Developing Models of the World

17 - 21 May 2021 @online

Aims for the virtual meeting

The workshop "Developing Models of the World" was concerned with fundamental questions about the development of human cognition. The aim of the workshop was to explore a diverse range of developmental questions through the lens of different computational theories and formalisms, with a specific focus on predictive processing and rational constructivism.

Key moments (key debates, breakthroughs, etc.)

Key debates revolved around the big questions in development and differences between the formal frameworks. Most discussions took place in small groups in breakout channels.

Outcome(s)

We identified a set of 7 targets for future research, some of them with concrete ideas for research questions and experiments. As a next step, we will submit a proposal for a special issue of the prestigious journal Topics in Cognitive Science, to which participants of the workshop will contribute articles.

Other comments

Despite the limitations of the virtual format, we had lively discussions, which often continued after the official program was over.

Organization

Preparation (synchronous and asynchronous strategies – see our Virtual Workshop Tips & Tricks document for concept definitions):
We used mainly synchronous strategies.

Duration of the workshop and time management:

The duration of the workshop was five days (as originally planned), but we had to reduce the program to about 4 hours each day because of the large differences between time zones.

Short- and long-term plans for follow-up

We are working on a proposal for a special issue and are considering organizing a follow-up, in-person workshop at the Lorentz Center.

Lessons learned for future virtual events

- be open to feedback from participants during the workshop
- adjust the workshop program based on this feedback if needed
- rather have more than too little time for discussion
- prioritize open discussion to talks from key-notes

Danaja Rutar (Radboud University Nijmegen, The Netherlands)
Johan Kwisthout (Radboud University Nijmegen, The Netherlands)
Tomer Ullman (Harvard University, Cambridge, USA)
Wanja Wiese (Ruhr University Bochum, Germany)

Lorentz
center

Beyond the Mobile-Cloud Computing Paradigm

31 May - 3 June 2021 @online

Description and Aims

Computing is changing from a pure elastic provisioning of virtual resources (or platforms) to a transparent and adaptive hosting environment that fully realizes the "everything as a service" provisioning concept, from centralised cloud to the edge, and from network and computing infrastructure up to the application layers.

In this workshop we explore how we distribute computing, storage, and ML executions across heterogeneous resources between cloud and end-user devices to strike a balance between the performance and user-centric factors such as data privacy and explainability. From scientific and community perspectives, our workshop intends to create a scientific community within the Netherlands of like-minded but also complementary-skilled researchers who are motivated to tackle the unique challenges of edge computing for unlocking its values in research and education.

Organization and Outcome

The duration of the workshop is 3,5 days. MS Teams is adopted as the core platform of communication and coordination. The workshop programme is organized according to a dedicated theme for each day. The first workshop day is on systems. The second and third day covers Edge AI, security & privacy, respectively. The final day is to summarize the workshop outcome and gather inputs for a position paper. On each workshop day, there are keynotes, panels, PhD talks, breakout sessions and social meetings.

Through the workshop discussions, participants agree on developing a joint research agenda and identifying unique challenges for which a higher critical mass and interdisciplinary team is necessary in order to address them at scale (Dutch and international level). Some participants also mentioned that there could be a second follow-up event as there is an interest in the community and many future research challenges yet to be addressed.

As one highlight of the event, our community efforts are awarded with a 4TU NIRICT Grant. The organizers have created a discussion platform through Slack to continue further discussion and cooperation after the event.

Lorentz Center (virtual) Support

The Lorentz center was an excellent choice to host this workshop. We gathered more than 70 participants. Overall, our participants are very positive about the programme and support from Lorentz Center to enable this virtual workshop.

Jan Rellermeyer (Delft, The Netherlands)
Aaron Ding (Delft, The Netherlands)
Suzan Bayhan (Enschede, The Netherlands)

Technologies for Enhanced Documentation of African Languages

31 May - 4 June 2021 @online

The workshop sought to be a testing ground for data and software carpentry where documentary linguists, language community members, computer scientists and software developers could exchange their knowledge and experience about the application of AI technologies to African languages and the field of documentary linguistics. The aim of the workshop was to bridge the gap between language documentation and language technology; minimize the compartmentalization and bring together computer scientists and language documenters; addressing bottlenecks in the language documentation pipeline. By bringing together language documenters and computer scientists we hoped to address the lack of AI-oriented data in language documentation and equip language documenters with the basic understanding of AI and language technologies.

Computer scientists and language documenters who otherwise would not know of each other and of each other's work were brought together. During the workshop both communities shared knowledge about language technologies and the type of data and needs in the language documentation side; some of the technological solutions offered by computer scientists were tested by the language documenters on their datasets and awareness was created among both communities about the possibilities and the challenges of applying language technology to low-resource languages. In particular, participants gained awareness about the need to prepare quality and quantity language data to harness the potential of NLP and AI in the documentation of African languages. Computer scientists who have developed language technologies have become aware of the type of data produced in the language documentation projects and the need of linguists, especially as far as the transcription bottleneck and the creation of ASR-oriented data is concerned. Feedback from the language documenters allowed computer scientists to fine-tune some of the tools for better use.

Two issues related to the African languages landscape that came to the fore during the workshop are how to make the available documentary data become known to the computer scientists and Ai community. In that sense while African languages are from the point of view of AI and computational processing "low resource languages", there are more resources available that can be profitably used. Moreover, given the multilingual nature of Africa one can profitably triangulate the learning processes for related languages using Multilingual ASR. The need for introducing basic coding literacy in linguistics programmes in the universities has been discussed at length and it requires special attention.

The workshop was structured around the issues of the transcription bottleneck and the creation of ASR-oriented data by language documenters. The programme included four plenary talks by experts in the field of language technology from both academia and the public sector; the talks were followed by discussions on specific topics and questions in break-out rooms. Several knowledge exchange sessions and hands-on training were organised each day: during these sessions language documenters were exposed to existing technological solutions and could apply them to their own data. Networking time was organised on wonder.

Sara Petrollino (Leiden, The Netherlands)
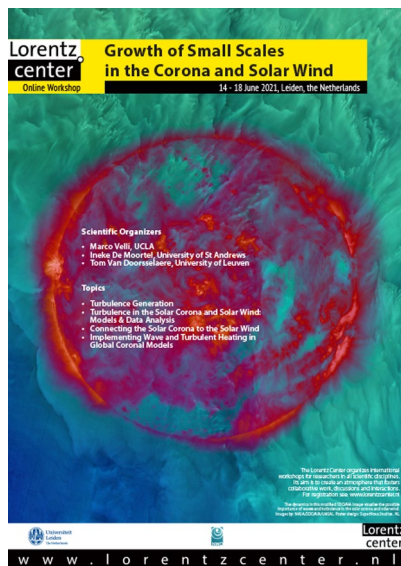**Feix Ameka** (Leiden, The Netherlands)
Daan van Esch (Amsterdam, Netherlands)
Mmasibidi Ms Setaka (Potchefstroom, South Africa)
Emmanuel Ngue Um (Yaoundé, Cameroon)

Growth of Small Scales in Corona and Solar Wind

14 - 18 June 2021 @online

Aims for the virtual meeting

The main aim of the meeting was to discuss the formation of small scales in the solar corona and solar wind. The scientific communities in these two fields are not often meeting at large conferences, which focus on these respective fields. The main aim was to have cross-over between the two communities. As scientific rationale, recent years have shown a lot of progress in the numerical modelling and observations of small scales in the solar corona. Those small scales are directly measured in the solar wind close to the Sun by the Parker Solar Probe. To model PSP observations, input from solar coronal modelling is needed. Moreover, PSP observations and associated modelling put constraints on solar coronal properties. The two-way interaction between the two communities will thus lead to cross-fertilisation of both domains.

Key moments (key debates, breakthroughs, etc.)

Several points came up for further investagation after the workshop:

- The possibility of kappa-distributions in the corona and its self-consistent evolution to an accelerated solar wind has harvested a lot of attention, and this could be used in follow-up studies in the solar corona with PIC simulations.
- Counterpropagating Alfven wave models of the solar corona do not seem to produce asignificant heating, even though this is the basis for many solar wind models. Perhaps uniturbulence plays a more important role than we thought.
- The presence of the lambda_perp parameter in solar wind models was scrutinised. This free parameter of the models plays a major role in the temperature of the corona (in the models) and caution is needed in utilising it.
- On the last day, it was realised that the 1/f spectrum can be created by the process of phase mixing. This was the key realisation in the workshop, because the solar wind community has already investigated this aspect for several decades. This was found in the solar coronal community by analytical models and confirmed with numerical simulations.

Outcome(s)

We think the main outcome of the workshop was to generate further collaborations between the fields. As can be seen in the above key moments, the transmission of information between the two communities was very successful. The interaction lead to new realisations, even in decade-old problems, such as the 1/f spectrum. Several of these new collaborations will lead to follow-up papers.

Other comments

At first I was rather sceptical about organising the meeting online, but afterwards, I have enjoyed it very much and gained a lot of new ideas.

Preparation

The workshop was prepared as a synchronous meeting, with talks at the set times allowing forscientific discussion afterwards. The programme was concentrated around noon European time, in a time block of 4 hours.

Duration of the workshop and time management

The workshop took place in 3 blocks around European lunch time, with 2 long breaks. The breaks were especially intended to allow for the talks and discussion to run overtime. The last afternoon block was with talks of young scientists, followed by a group discussion.

Short- and long-term plans for follow-up

During the workshop, it was suggested to have a similar workshop in the future, when in-person meetings are once again possible after corona-times. It was suggested to apply again to the Lorentz Centre in a few years or write an application to the International Space Science Institute in Bern (Switzerland). Moreover, people thought that also small scale meetings would be possible without such applications, in one of the institutes of participating scientists.

Lessons learned for future virtual events

With a relatively small group, it is possible to organise such small scale meetings. The main disadvantage is the lack of coffee break and lunch time with other meeting participants. Also, it is much harder to interact with younger scientists, who don't get so much visibility in the online setting. Discussions are quickly dominated by senior scientists and junior scientists are apparently too shy to offer their opinion. Despite all these shortcomings, the meeting was appreciated well by the senior and junior scientists and yielded many interesting discussions.

Comments/points for improvement for the Lorentz Center team.

The preparatory meetings with the organisers are mainly aimed at people unfamiliar with conference planning. For us, a lot of the information in those meetings was not strictly necessary. The support during the workshop was great.
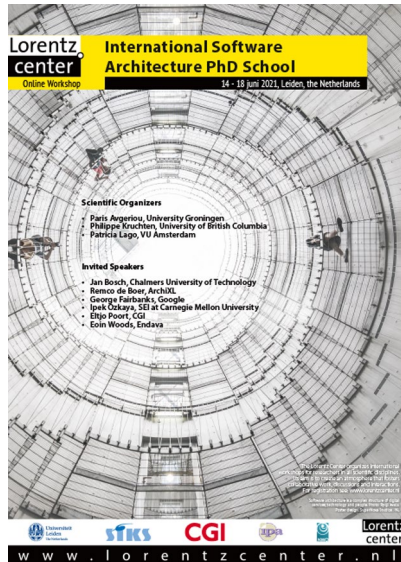
Tom Van Doorsselaere (Leuven, Belgium)
Ineke De Moortel (St. Andrews, UK)
Marco Velli (Los Angeles, USA)

International Software Architecture PhD School (ISAPS)

14 - 18 June 2021 @online

Scientific

The goal was to organize a fourth instance of a *doctoral school* in the field of *software architecture* to provide PhD students and practicing architects from industry the opportunity to learn from the leaders in the field. This takes place through educating the participants in the most recent concepts, methods, 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.

Throughout the week, the 39 PhD students worked in seven groups on the industrial case studies submitted by software architects from industry (from three different companies), each group under the supervision of a senior researcher acting as moderator. The outcome of each group work was a solution (at various levels of maturity) to the architecting problems formulated in the respective case studies by the case owners.

These solutions and associated reflections and insights, 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 bridges 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 greatly appreciated talking to architects, senior researchers and professors, and in particular the new insights they gathered from the architects during the working sessions. They also liked the team work; the real-world architecting cases; the online game for architecture design decision making; flipping the classroom by blending pre-recorded video-lectures followed by live discussions with the lecturers; and the informal atmosphere that helps everybody to engage and interact. The combination of industrial and research talks was also valued highly. Several of them were not aware of the notion of technical debt, or the role of architecting in agile processes and DevOps. Another 'lightbulb' moment (coming back from last year, too) was that social/human aspects in architecting are often even more important than technical aspects. Both PhD students and the architects admitted that they enjoyed working with each other and found links between the topic they work on and other topics covered during the school.

Organization

The first edition of the PhD school in **2017** had been overwhelmingly successful and its participants had urged the organizers to repeat it on an annual cycle. In **2018**, the school aimed at consolidating the stated goals and maturing the format of the school before turning it into a regular event. Specifically, we made improvements regarding the following points: preparing the software architects to make the cases more uniform and better linked to the theory; tying the lectures together in a more coherent learning path; assigning students to the industrial cases according to their background and preferences; preparing the moderators in order to optimize their role within the industrial case studies. In **2019**, we kept all aspects that worked well, such as the combination of lectures in the morning and case-study work in the afternoon, and the involvement of practicing software architects from industry; in addition, we improved on the following aspects: explicitly asking students to approach lecturers and discuss their own research (which many of them did); arrange for moderation of the architecting cases to be consistent and adaptive to the individual groups; encourage more networking and interaction by

arranging an extra social event; enriching the program with three new topics as well as a game; inviting two additional lecturers from industry to improve the link with practice.

Given the impediments presented by the COVID-19 pandemic, we have decided to hold the **2021** school fully online. To this end, and given that both lecturers and participants were attending from different continents, we decided to: shorten the program (to cope with online fatigue) and schedule it in a time-slot that would work for most time-zones around the globe; flip the classroom by pre-recording the lectures and focus on activating the students to discuss with the lecturers; and dedicate most of the time to the working sessions. In spite of the limited time for social interaction, the school was also a great success and the students provided positive feedback for all elements in the program. They especially liked the flipped lectures, which we are considering to keep also in the future as they give a great opportunity for the students to watch the video-lecture upfront and reflect on what they learn and share their questions and reflection in the live discussions; but also it opens up the opportunity in the future, for attracting speakers from anywhere in the world and blend the lectures with part online flipped classes and part on-site live lectures. A generalized feedback we have received was the wish to have more time for all the program elements: more time for the game, for the live Q&A sessions, for the working sessions, and not surprisingly for more socialization. We made use of the Wonder space, which was quite nice and easy to use, but a minority of the participants really used that. This year we have also urged the students to set up a Slack workspace: they took the initiative and created it; this way we can stay connected beyond the duration of the school edition, use it as a communication channel for staying in touch and who knows, initiate new research activities.

Finally, as in the previous years we conducted an online retrospective session, by using www.teamretro.com, 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. Again, we recommend this retrospective format to the organisers of other events, too. As points for improvement, we plan to introduce blended online-onsite lectures, ensure that the cases have an even sharper scope (neither too big nor too small) and architecture flavor (not too abstract). Given that every year a new population of participants is attending, we plan to continue the ISAPS series, hopefully again at the Lorentz Center.

Lorentz Center (virtual) Support

The provided support is great and timely as usual. Given the online setting of the school, which was new this year, we could collect the following comments/points for improvement.
MS Teams worked fine especially for switching between breakout rooms, game rooms and the plenary room. However, we experienced regular and significant drops in quality which, for instance, hindered sometimes the communication with some students or even caused participants (and organizers) to suddenly drop out. We also complemented Teams with Google Drive which everybody is used to, and that worked smoothly for file sharing in all activities.

To our surprise, some **students dropped out** of the working groups and informed us when the school started that they could not join them. This seems to be a phenomenon linked to being online, for which some people might perceive the working sessions as "optional" (which does not happen when everybody is physically in Leiden). This is undesirable as (i) the students attending only part of the school do not qualify for the full certificate; and (ii) we had to reject many applicants (one third) due to a lack of seats. Finally, it would be useful for us, as organizers, to have the **emails** of the participants, so it could be an idea to ask for their permission upfront.

Paris Avgeriou (University of Groningen, the Netherlands)
Philippe Kruchten (University of British Columbia, Canada)
Patricia Lago (Vrije Universiteit Amsterdam, the Netherlands)

Computations that Matter
Towards accurate predictions for electroweak baryogenesis
21 - 24 June 2021 @online

Scientific

Electroweak Baryogenesis (EWB) is a mechanism that can explain the generation of the asymmetry between matter and antimatter during a phase transition in the early universe. The new particle physics required for this mechanism can be probed in present and near-future experiments. The goal of our workshop was to assess the status of EWB, by discussing which models of new physics are still consistent with experimental constraints, and by discussing the computational methods that are used to compute the value of the asymmetry, with a focus on the computation of the velocity of the bubble walls and the derivation of the transport equations.

The talks and discussion about the models lead to the conclusion that a successful model for electroweak baryo-genesis can be consistent with experimental constraints in three cases:

- the phase transition and CP-violation take place at a relatively high temperature.
- there is a cancellation mechanism between different CP-violating phases, which suppresses the EDM signature.
- the CP-violation takes place in the lepton sector - but this conclusion depends on the validity of the so-called vev-insertion approximation.

One important input to these calculations is hereby the velocity of the phase transitions fronts. Recently, several new effects from particle showers and splitting mechanisms have been taken into account. Some of the assump-tions entering these analyses have been criticized, which was a topic of vivid discussion at the workshop.

A major recent breakthrough is the finding that baryogenesis can be successful, even with relativistic bubble walls, in contrast to what was previously thought. Two groups reached this conclusion, using different assump-tions. In the discussion session these assumptions were compared with each other, and a better understanding of the relation between the methods was obtained.

The difference between two computational schemes - the semiclassical approach and the vev-insertion approxi-mation were discussed. Some preliminary results were presented that demonstrated that the two derivations describe different physical effects, so they can both exist. There was a lively discussion about this issue, and it has not yet been settled.

Organization

As all but one of our workshop participants were located in Europe and North and South America, we chose for a synchronous format, with all scheduled talks and discussions taking place between 15.00 and 19.00 during the four workshop days. Typically, the first talk of the day was a longer talk (about 45 minutes), followed by a couple of shorter talks (25 minutes). We had 5-10 minute breaks every hour. The talks were all recorded, such that participants could also watch them at another moment. All workshop days ended with a plenary discussion ses-sion. In addition to the scheduled talks and discussion sessions, we had several slots in the schedule in which participants could initiate additional discussion sessions.

Lorentz Center (virtual) Support

Overall, we as organizers and also the participants were very happy with the support by the Lorentz center. Some participants reported initial IT problems which have been very quickly and professionally resolved by the Lorentz center team. Also the MS Team environment worked really well, even though most participants were not used to the platform before.

The registration form - which had to be downloaded, filled out and then uploaded again - was a source of frustra-tion for some participants. It would be very useful if this could be replaced by an online form. The emails with information sent to the participants were often a bit long, which sometimes lead to inefficient communication. Still, feedback to us from the participants was overwhelmingly positive due to the friendly and collaborative spirit of the community and the Lorentz Center team.

Thomas Konstandin (Hamburg, Germany)
Marieke Postma (Amsterdam, the Netherlands)
Jorinde van de Vis (Hamburg, Germany)

Nano-MRI
The next generation
28 June - 2 July 2021 @online

Scientific: General

The aim of the workshop was to bring together young researchers of the Magnetic Resonance Force Microscopy (MRFM), NV-center and Electron Spin Resonance-Scanning Tunneling Microscopy (ESR-STM) communities. The three communities work towards the common goal of nano magnetic resonance imaging, yet each technique has a different approach. It was set up in anticipation of the 7th nano-MRI conference that will take place at the Weizmann Institute of Science in March 2022, but that was unfortunately cancelled in 2020 and 2021 due to covid-19. Thus many young researchers did not have an opportunity to present their work since 2018, while this is crucial in an early stage of one's career. New researchers could not meet their peers and learn about the field, missing networking opportunities. The workshop brought together PhD students and postdocs who for a large part had never met before. It also brought them in touch with young PIs and a few senior PIs.

Scientific: Podium sessions

Practical aspects relevant to all three fields were introduced in the form of short overview presentations by experts from each field, followed by 30 minutes where the experts discussed among each other and with the audience. Four podium sessions covered the topics of spin manipulation techniques, dissipative phenomena, sensor position and technical aspects. We achieved with this format that participants learned about the similarities between the techniques and that researchers new to the field familiarized themselves with important open questions.

Scientific: Participant talks

Young researchers presented their work in short talks in parallel sessions. This gave many researchers an opportunity to present and allowed for small (25-30 participants) groups to have lively discussions. In these sessions the speakers came from different techniques, this led to questions from researchers from different techniques. A good feature was the "discussant" assigned to each speaker, another participant who had to prepare specific questions. This promoted active participation and lowered the barrier for general questions. We achieved our goal of providing young researchers with the podium they were missing due to the pandemic, we got feedback from participants who specifically appreciated this aspect.

Scientific: Open discussions

To promote hands-on discussion there were several open sessions in "wonder" where participants had the opportunity to talk to each other freely. We refrained from planning specific discussion topics, which proved a successful strategy. The sessions gave rise to meaningful discussions regarding hands on challenges. One such example was a group of researchers from the NV community who all discussed a common problem in sensing. It also promoted mingling so that participants could get to know each other, sharing stories (about failures in the lab, the early history of MRFM, …) like one would in the

coffee corner of a real-life workshop. Several participants gave positive feedback saying that in many online workshops, participants do not meet at all and here there was a good opportunity.

Organization

The workshop took place over 5 days for 2-3 hours a day. The schedule was set to accommodate for the global time difference between participants. To make best use of this limited time, we provided asynchronous content in the form of three pre-recorded talks, each introducing one of the main techniques. We found that although this seemed like a good option, many participants were not committed to watching these talks before the workshop. The virtual platforms MS teams and "wonder" both worked very well, the first for talks and podium discussions and the latter for open discussion. For some participants, switching platforms did not go smoothly, which is why we would try to avoid too much switching in future virtual events. For the same reason, virtual coffee breaks in "wonder" should be at least 30 minutes long.

For a short term follow-up, some participants will meet for lab visits if the pandemic situation allows. Next year, the 7th Nano-MRI conference in Israel will provide an opportunity to meet each other and senior researchers in real life and build on the connections that were created during the online workshop.

Lorentz Center (virtual) Support

The Lorentz center provided good online support for the participants who had technical difficulties. Also, the preparatory meeting in MS teams was good, it helped the workshop to run smoothly. Furthermore, we really appreciated suggestions for the program, as for example introducing "discussants".

Gesa Welker (Leiden, Netherlands)
Martin Héritier (Zurich, Switzerland)
Lukas Veldman (Delft, Netherlands)
Laëtitia Fariancci (Delft, Netherlands)
Leora Schein-Lubomirsky (Rehovot, Israel)

The Paradox of Genres in Discourse

5 - 9 July 2021 @online

Scientific

Discourse genres are important in our everyday life. Being able to function in society requires having a sufficiently large repertoire of genres at your disposal: one should know how to perform in a job interview, how to fill out a tax form, how to read news or governmental information. In an era in which new technologies are introduced at great speed, new genres develop on the fly. This makes genre studies an interesting and dynamic field. Interestingly, however, our scientific knowledge about genre is limited. Genre is a complex and multifaceted concept, comprising linguistic, pragmatic, and content-related knowledge with psychological, social and communicative aspects. The concept of genre thus crosses traditional theoretical and disciplinary borders. This workshop brought together researchers from different disciplines in social sciences and humanities to further our understanding of the notion of genre.

Our workshop aimed at bringing together researchers from different disciplines and different perspectives to work towards a more coherent, multi-disciplinary conception of genre. The workshop built on the Virtual Preparatory Sessions we organized 8-10 June 2020 in preparation of this year's 'real' workshop. All of last year's participants were re-invited. Eleven participants had to decline for a variety of (personal) reasons. Seven new participants were invited that we expected to bring in relevant new expertise. All in all there were 30 participants, from different countries (BE: 1, DK: 1, GE: 3, IT: 2, NL: 17, UK: 1, US: 5).

The workshop started with a kick-off session for which we asked four participants representing a variety of research disciplines to prepare 10-minute presentations (followed by 10 minutes of discussion) to sketch their take on genre, the burning issues they identify with respect to genre research, and their favorite methods to study genres. The core of the workshop consisted of work sessions in which small interdisciplinary groups (2-6 participants) laid the bricks for a chapter for an edited book volume setting the scene for a multidisciplinary approach to theory and applications of discourse genres we intend to publish. The subgroups were formed around a number of pre-defined topics that were identified as promising venues for genre research during the Virtual Preparatory Sessions last year (basic issues in genre research, stability and variation in genre forms, innovative methods to study genre, genre pedagogy, genre in journalism, and genre and cognition). Because of the time zone differences, the subgroups organized their meeting themselves in timeslots that fitted the working schedules of their participants.

The complete group of participants met on a daily basis in a two hour plenary session. On Tuesday the plenary session was devoted to kick-starting the work sessions. On Wednesday and Thursday the subgroups reported on their plans and progress. These reports were followed by lively plenary discussions during which other participants asked questions and gave their advice. Key debates identified during the session discussions concerned the notions of multidimensionality and multimodality of genres, the role of language and cognition in identifying genres, and the dynamic nature of genre. A clear result was also that these kinds of conversations are crucially important for clarifying our conceptualization of the genre notion. Although the 'real work' was done during the work sessions, which offered the time and opportunity to exchange views and construct a truly multidisciplinary approach to the topic at hand, we were positively surprised to see how the plenary sessions generated creative solutions and sometimes heated but very constructive debate, despite the obvious technical and social limits inherent to virtual meetings. On the last day of the workshop one of the organizers presented a closing lecture in which the results of the workshop were discussed from an integrative perspective, presenting a coherent research agenda for future genre research.

The workshop resulted in seven promising chapter proposals that we are currently integrating in a prospectus for an edited volume setting the scene for a multidisciplinary approach to theory and applications of discourse genres. We already have concrete interest from different publishers. Additionally, a number of the subgroups announced intending to prepare a grant proposal based on their work during the workshop. We are planning to organize a follow up meeting early 2022 discussing progress in the book chapters and other projects resulting from the workshop. By doing so, we intend to consolidate the networking function the workshop has had (re. the responses to the questionnaire distributed by the Lorentz Center after the workshop).

Preparation (synchronous and asynchronous strategies – see our Virtual Workshop Tips & Tricks document for concept definitions) Preceding the workshop, the participants were asked to submit a Research Statement in which they presented their research interests (including references to previous work on discourse genres), their "burning issues" with regard to genre research, their aims for the workshop and their contact details. The Research Statements were shared on the workshop website to enable the participants to introduce themselves and to get an idea of the backgrounds of the other participants. A week before the start of the workshop we invited the participant to subscribe to one or maximally two subtopics to work by publishing an excel file stating the main topics for the workshop (see above). The participants were invited to indicate what angle they would like to take, and to contact other participants to explore collaboration options. We also shared the slide decks and the scientific report of last year's Virtual Preparatory Sessions for inspiration.

Duration of the workshop and time management: the workshop lasted five days. It consisted of a daily plenary session (2 hours) and one or two daily work sessions per work group (2 hours each). Four hours of virtual meetings per day proved to be intense, but feasible.

Platform(s) used before and during the workshop: we used the workshop website hosted by the Lorentz Center and the MS Teams environment offered by the Lorentz Center. Preceding the workshop we communicated using e-mail and Google Drive.

Short- and long-term plans for follow-up: We are currently preparing a prospectus for an edited volume presenting and furthering the lines of research explored during the workshop. A number of the subgroups announced intending to prepare a grant proposal based on their work during the workshop. We are also planning to organize a follow up meeting early 2022 discussing progress in the book chapters and other projects resulting from the workshop.

Lessons learned for future virtual events: Although we do believe that the workshop helped us realize our goals, we also experienced how important face-to-face onsite contact is to create an atmosphere that promotes the networking function and creativity. We as organizers liked the Wonder app as an instrument to gather with the workshop participants in a more informal setting after the daily workshop sessions, but we hardly succeeded in persuading them to join us. We were told that most participants experienced 2x2 hours of online sessions as exhausting and didn't feel like joining onscreen again.

Lorentz Center (virtual) Support

Comments/points for improvement for the Lorentz Center team: The support from Lorentz was very welcome (keeping in touch with participants, consultations about formats). Combining the workshop website for asynchronous activities and MS Teams for live events worked well, despite a small number of technical issues that seem to be inherent to the application itself. The workshop coordinator did a wonderful job offering swift support at any (very small number of) incident.

Ninke Stukker (University of Groningen , Netherlands)
John Bateman (University of Bremen , Germany)
Danielle McNamara (Arizona State University, USA)
Wilbert Spooren (Radboud University Nijmegen, Netherlands)

Metrics in Multiparameter Persistence

19 - 22 July 2021 @online

The workshop brought together specialists and junior researchers in multiparameter persistence to study the problem of metrizing the space of multiparameter persistence modules. This topic is of particular importance as multiparameter persistence has a lot of promise as a data analysis tool but mathematical and computational challenges have thus far limited its applicability. Beyond the problem of finding suitable metrics, the workshop also discussed other equally important facets of this quickly emerging field.

The workshop took place in a virtual environment and in order to accommodate participation from all over the world, the presentations were scheduled for the afternoons (CET). The workshop saw many inspiring talks touching upon the many sides of multiparameter persistence: from newly introduced universal distances, and machine learning, to applications to time-varying and biochemical data. The talks were given by researchers at all levels, with nearly half of the talks given by Ph.D. students and post. docs.

In the late afternoon, the participants separated into groups to work on various topics proposed by the organizers. While some of the breakout groups were discussing concrete distances, e.g. "noise systems" and "computability of distances", other breakout groups were of a more interdisciplinary nature. Notably, there were groups discussing the "statistical foundations of multiparameter persistence", as well as "applications to time-varying data". Beyond succeeding in making notable progress on several of the topics, the working groups proved to be a particularly useful tool in

1. Introducing researchers new to the field to the important problems facing the field,
2. Connecting junior researchers with senior researchers.

Several of the groups intend to continue their discussions beyond the workshop. Hopefully, we will be able to organize a follow-up workshop at the Lorentz center within a year or two.

In our experience, the workshop format worked really well, and the feedback from the participants was also very positive. Furthermore, while the transition from offline to online even forced us to modify our original goals (the workshop was originally scheduled for July 2020), it did allow for the participation of a significantly higher number of participants (78 in total).

The fact that the workshop ran smoothly is largely due to the excellent work by the staff at the Lorentz Center.
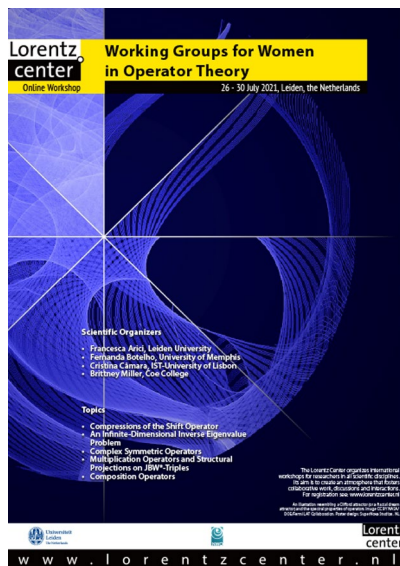
Ulrich Bauer (München, Germany)
Magnus Bakke Botnan (Amsterdam, The Netherlands)
Michael Lesnick (Albany, USA)

Working Groups for Women in Operator Theory

22 - 26 July 2021 @online

Description and Aim

Operator theory is at the root of several branches of mathematics and offers a broad range of challenging and interesting research problems. Many classical areas of analysis rely on techniques from operator theory, including Banach space theory, differential equations, and dynamical systems. The broad field of operator theory also provides powerful tools for the development of other scientific fields including quantum theory, physics, and mechanics. While the field is extremely prolific, early-career mathematicians often feel at a loss with so many possible avenues to explore, all requiring mastery of numerous techniques, mathematical subtleties, and deep understanding of important results. In addition, a survey of recent conferences on related topics reveals that many have offered excellent talks on recent research advances in operator theory, but few have provided a visible component geared towards preparing a new generation of researchers from underrepresented groups or a broad background on prominent research topics within operator theory.

We sought to plan a workshop to include a succinct overview of state-of-the-art techniques and recent trends in operator theory and its applications; intensive group problem-solving sessions with each working group led by 1-2 project leaders and involving graduate students/postdocs, early career researchers, and more experienced researchers to discuss possible strategies and solutions to open problems; and structured conversations focused on career and research advancement and other topics of interest. We hoped to bring together women in operator theory and related fields to work collaboratively on research projects and to form a network of support through research collaborations and professional mentorship.

Outcomes

The workshop achieved our main objectives:

- *Learn recent research trends and useful techniques in operator theory:*
  In the year leading up to the workshop, the project leader(s) of each working group recorded introductory lectures that were accessible to all participants. Additionally, each participant shared their own expertise within their working groups.
- *Discuss strategies and solve open problems in operator theory and related areas:*
  The working groups met for 1-2 hours each day to make progress on their group's project and spent their time together in different ways. Some groups had presentations from each participant, while others discussed various approaches to open problems.
- *Initiate solid and long lasting research collaborations among participants:*
  Each working group reported that they will continue meeting virtually to make more progress on their projects together.
- *Increase the number of women researchers in operator theory and related areas:*
  Although difficult to measure with one workshop, we sent 3-5 additional invitations to female participants who were recommended by other participants.
- *Create an active network of support for female researchers and young researchers in operator theory and related areas:*
  The group work time was viewed by all participants, including project leaders, as a learning experience and everyone was supportive of each other. As a result, participants reported that they were very comfortable sharing in their working groups and felt very supported, which

allowed them to ask questions and to slow the pace if needed. This is not always the case at other conferences or workshops. Furthermore, the roundtable discussions seemed to be very fruitful and engaging for participants, and they allowed participants to connect and get to know each other better while discussing topics (not necessarily about research itself) that researchers encounter. We have established an email listserv so participants can stay connected and learn about other upcoming opportunities in operator theory.

Program

The program for each day was no longer than 3-4 hours, which seemed to be an appropriate amount of time for a virtual workshop. Each day consisted of 1-2 hours of group work time, with the meeting time and duration being decided by each group based on their time zones and preferences. Each working group provided updates throughout the week. The rest of the program for each day consisted either of a 75-minute panel discussion or of a 45-minute plenary talk followed by a 30-minute roundtable discussion. We should have allowed more opportunities for roundtable discussions, especially since participants seemed very engaged during these conversations and enthusiastic about the topics.

Format

Although a virtual format is not ideal for beginning collaborations on mathematical research, there were many features of MS Teams that were useful in the organization of the workshop. Each working group had their own channel to meet and share documents that they could access anytime. The main challenge seemed to be with technical difficulties participants had accessing the workshop environment in MS Teams, but once these were resolved (thanks to the Lorentz Center staff), the workshop seemed to run smoothly.

Acknowledgements

Francesca Arici (Leiden, The Netherlands)
Fernanda Botelho (Memphis, United States)
Cristina Camara (Lisboa, Portugal)
Brittney Miller (Cedar Rapids, United States)

Non-Reversible Markovian Monte Carlo

2 - 6 August 2021 @online

The aims of the virtual meeting were:

1. enabling cross-discipline communication and providing a common depth of understanding of current theory and methods,
2. setting the research agenda in the area by identifying and prioritizing challenges, formulating questions of common interest and importance, and discussing possible angles of attack,
3. creating a substantial and diverse community of individuals who are aware of the potential of non-reversible methodologies and have been enabled to apply these methods and/or solve problems in the field.

Our most important aim was to get the disparate communities and research groups talking to each other. This worked far better than we had dared to hope of a virtual conference.

Key moments occurred in discussions following the tutorials or some of the presentations, although these involved mostly senior researchers. Overall there was a strong sense of desire to work together on this topic and push further developments. Some new connections between statisticians and physicists were established. Also, interactions on GatherTown (which was also used for poster sessions, as conversation starters) were fruitful in establishing new connections between researchers and discussing research topics, especially amongst junior researchers and students.

Outcome(s)

A common understanding of the state of the art along with remaining challenges. Broadening and some deepening of connections amongst researchers and disciplines.
Specifically, some fruitful discussion about the sharpness of some theoretical results, and the nature of types of non-reversibility (velocity / global moves / more general) considered so far in the literature. People asked speakers for references, which is a sign that the workshop was useful — this worked across the physics/maths boundary.

Preparation

Because the event was online, we reduced the programme each day from a full day of activities which would include talks, paper discussions, general discussions and break-out groups, to an afternoon of activities each day which typically included a couple of talks and/or paper discussions with some timetabled time on GatherTown. The GatherTown environment was available throughout the Workshop.

Duration of the workshop and time management

One week workshop, three to four hours per day for the online workshop. There were three reasons for the reduced but more structured timetable. (1) to make the main programme relatively accessible from both Europe and the Americas; (2) to reduce fatigue from staring at a screen for too long - better to have a shorter timetable with good engagement than a longer one with poor engagement; (3) to allow time for informal discussion around the main sessions.

Short- and long-term plans for follow-up

Participants have expressed the view that there should be another such meeting in person in order to develop the interactions.

Lessons learned for future virtual events

We received very positive feedback about the use of GatherTown as a general feeling among junior researchers. More senior researchers participated less actively in this framework, but were more vocal during the Teams meetings.

The Teams environment has pros and cons. Pros: a sense of community, and persistent communication (compared to chat on Zoom, for example). Cons: difficulties accessing the framework for several speakers caused some stressful moments especially on Monday.

Other comments

The number of attendees never dropped below +-35, which we thought was fairly impressive for an online event. In other online conferences/workshops we have never seen this level of interaction and engagement over a week.

The junior channel wasn't used - but they did make good use of GatherTown.

Comments/points for improvement for the Lorentz Center team

A simplified application procedure would be welcome, for us this required about as much time and effort as a grant application for several PhD students. At the same time the process has resulted in more awareness on our side in terms of e.g. ideas for interaction in the program and for increasing diversity amongst participants.

We were impressed by the practical support offered by the Lorentz team during the workshop.

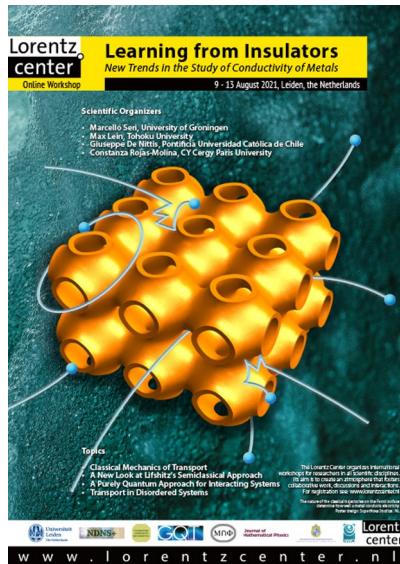**Christophe Andrieu** (Bristol, UK)
Joris Bierkens (TU Delft, NL)
Chris Sherlock (Lancaster, UK)
Marija Vucelja (Virginia, USA)

Learning from Insulators
New Trends in the Study of Conduction Properties of Metals
9 - 13 August 2021 @online

Description and aims

The idea behind the workshop was to reinvigorate interest in the mathematics of transport properties of conductors. While this is an old topic, in recent decades the focus of most mathematical physics sub-communities lied with insulators and topological insulators. Many of the methods initially developed for (topological) insulators can be applied to conductors: new rigorous semiclassical methods yield semiclassical equations of motion with subleading corrections that hitherto have not yet been studied. Advances in dynamical systems and symplectic geometry could help understanding the role of such corrections. Furthermore, functional analytic and operator-algebraic approaches seem necessary if one wants to includes effects of disorder and electron-electron interactions.

Consequently, the main aim of the workshop was to bring in the same room people with diverse scientific backgrounds and who have not met before, and to have the workshop act as an incubator for new collaborations. Specifically, organizers and participants included experts from symplectic geometry, dynamical systems, semiclassics, functional analysis, spectral theory, random operators, and non-commutative geometry.

The idea of being in the same room was a key part of the workshop concept and, thus, the outbreak of the COVID-19 pandemic proved particularly challenging. This required us to completely revisit the whole concept twice, first to fit into an hybrid scheme and finally in an online-only one. In the final plan, mini courses were taken out of the live program and uploaded in advance for the participants's benefit, and the number and lengths of contributed talks were cut in half. This freed a lot of time that we have then allotted for discussions. Further, to allow people from Asia to the Americas to attend, the program was split into a Core program suitable for live participation from all time zones and an Encore program, that allowed participants to at least participate in the morning or evening program according to their time zones. Topical days were kept as much as possible; exceptions were necessary to accommodate scheduling constraints.

Overall, there were 43 participants and 4 organizers with very diverse backgrounds:
- 5 participants were female (about 13 %), 38 male.
- 5 talks were given by female speakers (about 29 %), 12 talks by male speakers
- 25 % were in the early part of their careers, 39 % in the middle and the remaining 35 % were senior researchers.
- Participants hailed from Asia (China, Japan), Russia, Europe, and the Americas (USA, Chile, Canada).

Experience with online-only workshop during Covid-19 pandemic

Travel restrictions made it impossible to have a large enough in-person component and the workshop was ultimately held online-only. In collaboration with the Lorentz Center, the program was redesigned to accommodate 12 hours's worth of time zones. The organizers would like to thank the Lorentz Center for their input and support, which was crucial to react to changing circumstances on the fly, and their insistence on having sufficient opportunity for discussions.

In hindsight, the redesigned program worked remarkably well when compared with other online-only programs and received extremely positive feedback from many of the participants. In the end, the four mini courses were made available offline in advance to the participants and the workshop had only 2 Core talks and 2 Encore talks per day. The talks were also shortened significantly, because in the experience of the organizers the listeners's attention spans tend to be smaller for online events. This allowed us to dedicate a large amount of time to questions, discussions and breaks. In the end, most talks were recorded and have been published on Youtube (with the speakers's and participants's permissions).

The discussion sessions, informal and not recorded to allow people to talk freely, proved surprisingly popular and saw a much larger participation than what our previous experiences would have suggested. Notes were taken by the organizers to structure the thoughts and a 5–10-minute recap was given at the beginning of every Core session to keep participants from all time zones updated. For the mini courses one lecturer submitted written lecture notes and the other three opted for "classroom-style" video lectures with handwritten boards rather than slides. The recorded mini courses were of varying lengths, ranging from 90 minutes to 12 hours; they have since been accessed surprisingly often as can be gleaned from e. g. their view counts on Youtube. In all cases this provided high quality pedagogical material to ease into the workshop topics and also received praise from many participants.

We expect that some of the lessons learned will also be incorporated in "traditional" conferences that will be held in the future. To mention but two, allowing people to participate remotely in workshops and conferences will be the default going forward. And organizers should allocate sufficient time to discussions at the expense of talks.

The streamlined program, shortened talks and generous breaks were very positively received by the participants. For example, it allowed participants outside of Europe to meet their parenting obligations. The main complaint we received has been, not surprisingly, that participants would have greatly preferred an in-person event. A few participants also had difficulties with Microsoft Teams, despite good support from the Lorentz Center.

Scientific outcomes

Overall, the workshop proved very successful from a scientific vantage point. It definitely succeeded in getting people to meet (virtually) and get them to see connections between their fields and others they were previously not aware of. The balance of speakers in terms of topics was spot-on, and the talks - as evidenced by the lively discussions - well-received.

There were also a few concrete outcomes:
- The bulk of the talks is available on Youtube.
- The notes for the discussions, which will be polished and extended in the upcoming weeks, are publicly available.
- A special issue of the Journal of Mathematical Physics will document the state-of-the-art. It is open to submissions from all participants, and we have specifically asked all speakers to contribute.
- On the last day there were informal inquiries about a follow-up workshop, preferably held in-person to further this line of investigation.
- There were a few concrete discussions about specific scientific works and new collaborations.

All in all, the material gathered during the workshop will provide a good resource for (young) researchers to get an overview of the subject and the current state-of-the-art, in order to be able to start working on it.

Giuseppe De Nittis (Pontificia Universidad Católica de Chile)
Max Lein (Tohoku University)
Constanza Rojas-Molina (CY Cergy Paris University)
Marcello Seri (University of Groningen)

Perspectives on Scientific Error
Comparing history and parsing viewpoints
16 - 19 August 2021 @Oort / hybrid

Description and aims

Recent studies reveal a high prevalence of errors in published research. Theoretical arguments suggest that many published findings are false, and reports across fields show that many experiments do not replicate. These errors raise important issues. From a practitioner's perspective, errors mislead and slow down research projects. From a philosophical perspective, scientific error raises questions about the right forms of scientific inference, scientific progress and the reliability of science as a source of knowledge. From the perspective of the public, scientific error undermines the epistemic authority of science and the degree to which policy-makers trust scientific experts.

During the last decade, countless meta-scientific studies (i.e., research on science and scientists) have been conducted to investigate the extent of these problems, statistical tools have been developed to identify them, and many solutions have been proposed and implemented to combat them. In addition, we are seeing the first results of meta-scientific studies on the effectiveness of these interventions. In short, we considered the time ripe for those working on these problems to reflect on these investigations, evaluate their results, and provide guidance in plotting the future of methodological development and error prevention.

This workshop was a first step in that direction. During each of the four days, one invited senior and junior researcher presented their perspectives on one of four themes: methodological reforms, statistical reforms, publishing reforms, and institutional reforms, followed by group discussion on gaps and opportunities in the afternoon. Our focus was on three main goals:

- Obtaining an up-to-date overview of the research on each kind of reform from senior expert researchers.
- Create a collaborative space for junior and senior researchers to identify gaps in knowledge and opportunities for improvement for each kind of reform.
- Lay the foundations for future discussions on research plans to address the gaps.

Tangible outcomes

With the help of designated note-takers, we have generated an extensive set of notes on the state of the field of metascience. The group discussions in particular have yielded a long list of potential gaps and opportunities in the four focus areas of the workshop: methodological reforms, statistical reforms, publishing reforms, and institutional reforms. We are currently working on turning this material into a position paper. The identified gaps and opportunities in particular will be useful to those that participated in the workshop and perhaps to metascientists more generally as a jumping-off point for future research in this area.

Organization

It was a lively and well-received workshop. We had about nineteen on-site participants, almost all of whom attended all four days of the workshop, and between twenty and thirty online participants at any given time, many of whom attended all four days but several others dropped in and out. The hybrid

format worked about as seamlessly as might be expected. In particular, on-site and online participants were generally able to interact on an equal footing during the formal parts of the workshop. The chat function was used extensively during the workshop and many people used the various emoji reactions to engage, creating a lively online platform. There was more of a distinction during the informal parts, as on-site participants had a few social events while the socializing opportunities for the online participants (in particular the Wonder coffee room) were barely used.

For most of the on-site participants (as well as the Lorentz Center employees, seemingly), it was the first in-person conference or workshop they had participated in since the start of the COVID-19 pandemic about seventeen months earlier. Several participants expressed above-normal levels of excitement to discuss metascientific and other matters with each other in person.

For the organizers, it has been a bit of a rollercoaster as we initially formulated our ideas in terms of a fully in-person workshop during January-March 2020. Subsequently we adjusted our plans several times as we faced uncertainty over whether a hybrid or even fully in-person workshop would be possible or whether an online-only format would be necessary. In some ways it feels like we organized three workshops, but the actual event made our efforts worth it.

Noah van Dongen (Amsterdam, the Netherlands)
Felipe Romero (Groningen, the Netherlands)
Remco Heesen (Perth, Australia)
Marjan Bakker (Tilburg, the Netherlands)
Don van Ravenzwaaij (Groningen, the Netherlands)

International Summer School on ICT for Sustainability (ICT4S)

16 - 20 August 2021 @online

Scientific

Information and Communication Technology (ICT) has a central role to play in digitalization and the transition to a sustainable society. ICT offers us a rich set of tools to collect and analyze diverse sources of data that help us develop and share new solutions, and increasingly, ICT provides new low-energy alternatives to physically moving people and goods around the planet. At the same time, ICT can erode democratic governance, reinforce inequality and exploitation, increase energy consumption, and seduce us into patterns of over-consumption and waste as we buy and discard an ever-growing set of gadgets. While ICT can help reduce energy consumption through effects such as dematerialization, at the same it generates new demands for energy consumption, for example for bitcoin mining and artificial intelligence. The complexities of these interactions between ICT, society and the economy must be disentangled in order to support the growing commitment to address negative impacts on the environment and society.

Since its inception in 2013, the ICT for Sustainability (ICT4S) research community has coalesced around a common set of research challenges that address this dilemma, 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 futures, transport, buildings, food, electricity, clean water, and the achievement of the sustainable development goals (SDGs).

The ICT4S Summer School 2021 aimed to build a bridge between related communities, kickstart new scientific collaborations and nurture the next generation of community members through a series of presentations by leading academics, and collaborative paper writing working groups.

Organization

The first edition of the school in **2017** had been overwhelmingly successful and its participants had urged the organizers to repeat it on an annual cycle.

Given the impediments presented by the COVID-19 pandemic, we have decided to hold the **2021** school fully online. To this end, and given that both lecturers and participants were attending from different continents, we decided to: (i) shorten the program (to cope with online fatigue) and schedule it in a time-slot that would work for most time-zones around the globe; (ii) flip the classroom by pre-recording the lectures and focus on activating the participants to discuss with the lecturers; (iii) and dedicate most of the time to the working sessions.

We gathered informal **feedback** during the closing session. Overall, it was unanimously positive; some participants mentioned (i) the high quality of lectures, (ii) the depth of the discussions; (iii) the diversity in the people attending as well as their backgrounds, and (iv) the excellent (virtual) support provided by the Lorentz Center workshop coordinator. Also, mentioned **points for improvement** that we plan address in a future edition, are: (i) adding slides to videos (a simple yet useful complement to the video-lectures); and (ii) a slack channel for postmortem discussions (we did not implement this for the whole school even if the working groups have independently created either google groups or slack workspaces to continue the collaboration beyond the duration of the school).

Outcomes and Research Outlook

The school kick-started seven working groups on the following topics: Rebound Effects; Digitalization and Sustainable Business; ICT, sustainability and Art; ICT to question Lifestyle; Ethics, Values, Agency; Green AI; and ICT and Degrowth. In addition, the interested participants started a "reading club". Many of the working groups are now working on joining research to be submitted to a.o. the ICT4S 2022 conference.

Patricia Lago (Vrije Universiteit Amsterdam, the Netherlands)
Christoph Becker (University of Toronto, Canada)
Jay Chen (ICSI, USA)
Daniel Pargman (KTH Royal Institute of Technology, Sweden)
Daniel Schien (University of Bristol, UK)

A Topological Theory of Tangent Distributions

30 August - 3 September 2021 @online

Description and aims

The idea behind the workshop was to bring together four different mathematical communi- ties, to foster new insights across discipline boundaries, and to act as an incubator for new ideas and collaborations. Specifically, organizers and participants included experts from contact and symplectic topology, sub-Riemannian geometry, index theory and spectral theory. All these fields have many common interests and the overarching commonality, in our opinion, was the centrality of tangent distributions.

Being in the same room was a key part of our initial concept. However, due to the size of the venue (and taking into account that many researchers had already displayed interest in attending), we reworked it immediately into a hybrid event. Unfortunately, the outbreak of the COVID-19 pandemic proved particularly challenging and it was ultimately necessary to revisit the whole idea and go for an online-only workshop.

The final implementation of the programme contemplated roughly two hours of talks per day (mini-courses to level the background of the participants) and the rest of the time was allotted for discussions and social breaks (an additional two hours). Furthermore, to make it easier for people from the United States to attend, the workshop took place during the European afternoon.

Overall, there were consistely 40 participants attending the talks, of which 30+ stayed for the discussions. On Monday and Tuesday these had the form of a conference-wide open discussion. From Wednesday to Friday participants gathered in smaller working groups (8-10 people in each). On Friday we held a closing discussion in which the spokepeople for each group provided a summary of the ideas brought forward in the groups.

Out of the registered particiapnts about 40 actively joined the conference (including the 4 organizers):

* 6 participants were female (15%), 34 male.
* Around 40% (15-18) were in the early part of their careers, but many of them attended solely the minicourses, 15% (5-7) were in their middle career stage, and the remaining were senior researchers.
* A large majority of the participants attending the workshop was based in Europe.

Experience with online-only workshop during the Covid-19 pandemic

We worked out the online-only programme in collaboration with the Lorentz Center. The redesign was meant to accommodate the time zones of the participants and maximise their opportunities to interact. The organizers would like to thank the Lorentz Center for their input and support, which was crucial to react on the fly to changing circumstances.

In hindsight, the redesigned program worked remarkably well when compared with many other online-only programs and received extremely positive feedback from the participants.
The minicourses were very informative and provided a fantastic selection of material from which to start understanding the different research interests and perspectives. In the end, all the lectures were recorded and have been published (with the permission of the speakers and the participants) on a YouTube channel.

The time freed from talks allowed us to dedicate a large amount of time to questions, discussions and social breaks, including one specifically aimed at helping young researchers to share their experiences and do some networking.

The discussion sessions and working groups took place in a very informal and friendly atmosphere: they proved exceptionally popular and saw a large participation (3/4 of the participants eventually joined these interactive sessions). We had decided not to record them on purpose, so people would feel completely free to make suggestions and ask questions. Some ideas had been collected and edited by the organizers in the weeks before the workshop in order to have an initial core of material to generate discussions. During the workshop itself, this material kept growing thanks to the common discussions; notes were taken collaboratively by the participants summarising the work carried out in the working groups.

Participants have been extremely positive about the experience, comparing it favorably to other online workshops. We believe that some of the lessons learned will also be incorporated in "traditional" conferences in the future, in particular the importance of allocating sufficient time to discussions at the expense of talks.

Overall, the streamlined program, the space left for discusions, and the generous breaks were very positively received by the participants. The main complaint we received has been, not surprisingly, that participants would have greatly preferred an in-person event. A few participants also had difficulties with Microsoft Teams, despite the good support from the Lorentz Center.

Scientific outcomes

Overall, the workshop proved very successful from a scientific vantage point. It definitely succeeded in getting people to meet (virtually) and allowing them to see connections between their own research area and other fields they were previously not familiar with. The minicourses have been extremely beneficial from this point of view and we are very grateful to the lecturers for their efforts to point out connections between their talks.

There were also few concrete outcomes:
- The courses are available on YouTube.
- The notes of the discussions, which will be polished and extended in the upcoming weeks, and will converge into a booklet which we will share with the participants.
- We are aware of various groups of people that want to keep discussing in order to further explore some of the ideas brought up during the workshop.
- There is significant enthusiasm for a renewal of the workshop, possibly in a physical form, in 2-3 years time. This will be particularly relevant if the working groups lead to new ideas and publications.

All in all, the material gathered during the workshop will provide a good resource for (young) researchers to get an overview of the subjects and their connections, as well as a curated list of open problems that can keep them busy for years to come.

Álvaro del Pino Gomez (Utrecht University)
Valentina Fransceschi (University of Padova)
Federica Pasquotto (Leiden University)
Marcello Seri (University of Groningen)

The Audible Universe

30 August - 3 September 2021 @online

Scientific

Incredible images of astrophysical objects are used by professional astronomers for research and by the public for outreach and educational purposes. However, we are all basically blind to the Universe. Most of the matter in the Universe does not produce or absorb any light and even that which does, mostly produces light that is outside of the narrow range of the electro-magnetic spectrum that is visible to the human eye. Challenging the idea that we should always use visualisations, there has been an interest over the past decade in converting astronomical phenomena into sound ('sonification'). The main drivers of these efforts are making astronomy more accessible to people who are blind or vision impaired (VI) and/or explore how sonification can enable a deeper understanding of the underlying data. However, so far these efforts have mostly been driven by enthusiastic astronomers themselves who may have limited expertise in sound perception and sound design techniques. Furthermore, the projects mostly lack associated peer-reviewed publications or rigorous scientific approaches to development or testing. To overcome these limitations, we brought together 55 experts, including astronomers interested in sonification, sound designers, experts in sound perception, and educators, with the goals to consolidate the work that has been done already to sonify astronomical data and to start a multi-disciplinary discussion about how to properly evaluate and design sonification tools.

We had three main sessions during the workshop:

(1) accessibility considerations in astronomy education and outreach. Many topics were covered, including: the need to raise awareness among the public, academics, and teachers that it is possible to be blind and be a scientist; the need to include accessibility into the design of new facilities and tools; the need to incorporate multi-sensory learning more into the school curriculum and; the possibility that an improved accessibility leads to innovation and helps everyone to approach science.

(2) discussion on how to improve the evaluation process of current, and future, astronomy sonification projects. It transpired during the workshop that some informal evaluation had been undertaken by certain project leaders. However, this evaluation was mostly carried out without following standard evaluation procedures, was often anecdotal and qualitative feedback and, crucially, is unpublished. The sound experts suggested several different approaches that can be followed to quantitatively and objectively evaluate astronomical sonifications. For example, shape recognition can be assessed by asking the users to draw what they are listening to, whereas the usability of a graphical user interface can be assessed through a questionnaire, and finally the efficacy of sonification for object detection could be tested by measuring the detection speed.

(3) discussion on how we can improve the design process used so far and to learn from the sound experts how to design future applications more effectively. Some working groups focussed on general applications that could easily be extended to other research fields, whereas other groups worked on applications specific to astronomy. A recurrent discussion focussed on how to give the audience a quick sonic overlook of the data versus how, instead, to convey more details. This is a well-known problem by the sound experts. They offered suggestions about how to handle and convey information in these cases. Sound experts also brought to the attention of astronomers some tools (e.g. Data Sonification Canvas) that could be helpful to have a structured and effective design strategy that accounts for the purpose of the sonification, the audience, the choice of mapping strategies, etc.

Even though we had to organize our workshop online and therefore we highly reduced the duration and scope of the meeting, we can claim it a success. The main outcomes of the workshop are the following:

+ Cross-disciplinary networking: Different communities have started to know each other and interacted
in a pro-active, constructive, and respectful environment. Most of the participants are willing to keep collaborating with each other on specific projects that have started during the meeting. We collected email addresses and interests and shared them among participants.

+ Consolidation: We have review talks led by astronomers and sound experts, which reviewed the current state of the field and possible ways to move forward. We have a preliminary agreement with Nature Astronomy to publish a special issue on this topic including (1) a meeting report; (2) a Q&A article on accessibility considerations in astronomy; (3) a review article on current sonification projects in astronomy; (4) a perspective article that will provide practical advice on how the astronomical community could draw upon the expertise of the sound community to make progress. We expect to submit these articles by the end of the year 2021.

Organization

Our workshop, 'Audible Universe', was run online from August 30th to September 3rd 2021 and it was advertised through the Lorentz Center first ever [sonified poster](). To enable participants from the Americas and the Australia and Pacific to attend at a reasonable hour, we organised two sets of live sessions each day, to allow for live discussions and working group activities. All talks and presentations were pre-recorded, and the participants were requested to watch these in advance of the live sessions. Each live session lasted for two hours, plus a final half hour "social event" when the participants could have informal chats. Pre-recorded material was available to the participants through the Microsoft Teams platform made available by the Lorentz Center. A plenary room and several breakout rooms were setup in MS Teams for the live sessions.

In the following we mention the main challenges that we faced during the online meeting, how we overcome them, and we discuss some lessons learnt.

+ It has been necessary to divide the participants in two main groups during the live sessions to overcome the problem of different time zones. This prevented the participants from easily knowing the outcomes of the discussions in the other group. To overcome these issues, the organizers took minutes during each session that were then shared with all the participants.
+ We could not organize proper social events or coffee breaks, as the virtual tools for this (e.g. wander. me) were not accessible for our VI participants. We organized instead some basic "social events" at the end of each live session during which the participants could have informal chats. They were also encouraged to create their own group chat through the Microsoft Teams chat channel.
+ We could not organize proper hands-on sessions during which the participants could experiment with the available sonification tools. Instead, we provided pre-recorded tutorials about some of the sonification projects that have been developed already.
+ Mixing participants with different backgrounds (e.g. astronomers, sound experts, educators, …) and personal experiences (e.g. VI and sighted participants) has proven to be key for the success of the workshop. We could not organize a proper initial 'get to know each other' activity that would help the participants to get a more in-depth knowledge of each other and to find a 'common language' to set the stage for future discussions. To overcome this issue, prior to the meeting, we had distributed written and pre-recorded audio bio information about each participant, so that everyone could be aware of who is going to be in the meeting and could start recognizing voices.
All these challenges however will easily be overcome with an in-person meeting.

We could identify some recurrent discussion topics that we could not address in depth due to the lack of time, but that would deserve proper discussion during a future in-person meeting. Some of them are: (1) the need for training the public and how to include sonification in the school curricula from an early age already; (2) how to overcome the scepticism of researchers and make sonification a mainstream tool; (3) the need (or not) to pay attention to the aesthetics of sonifications; (4) how to get

the right balance between standardization vs customization in our tools? It will be important to take up these recurrent themes as well as the prompts provided by the participants to widen and deepen the discussion during an in-person meeting. To this aim we have submitted a proposal to the Lorentz Center to have an in-person follow-up workshop in 2022. In the meantime, we have shared the email addresses of participants interested in collaborating with each other, so that they can organize themselves in working groups and keep collaborating on the activities started during the meeting.

Lorentz Center (virtual) Support

The Lorentz Center support has been extremely valuable and precious. The online format and the use of Microsoft Teams have been the major challenges during the meeting, especially given our need to have a workshop inclusive and accessible to all our participants.

Nic Bonne (Portsmouth, UK)
Chris Harrison (Newcastle, UK)
Kate Meredith (Williams Bay, US)
Nicolas Misdariis (Paris, France)
Anita Zanella (Padova, Italy)

Accelerating the Understanding of Rare Events

9 - 10 September 2021 @Oort / hybrid

SCIENTIFIC

Extracting mechanistic information is a central challenge in molecular simulations of rare events, from chemical reactions to self-assembly of living matter. The recent increase in machine learning (ML) and artificial intelligence (AI) efforts has completely revolutionized the way that researchers nowadays deal with such rare events. ML methods (neural networks, deep learning, etc.) have been picked up by the rare event community to construct models, optimize force fields, analyze results and even help to accelerate the sampling itself in an adaptive and iterative fashion. Until now the rare-event and the ML communities did not have the chance to come together to exchange recent ideas on these topics.

Aims for the virtual meeting

This workshop aimed to discuss state-of-the-art methods and future perspectives, as well as to make an inventory of outstanding problems in the application of statistical mechanics and machine learning (ML) approaches for enhanced rare event sampling, information extraction, and the construction of reliable and meaningful models from atomistic simulation data of rare events in complex systems, in a wide range of fields ranging from physics and chemistry to materials science and molecular biology. In addition, to map the state of the art in machine learning for rare events.

Overall WS aims included:
- Exchange of information on new theories, methodologies, and applications
- Inventory of unsolved and emerging problems in the field
- Insight into mathematical and physical foundation of these problems
- Discuss solutions of these problems in small groups & plenary
- Discussion of future directions of research in the field
- Forge new collaborations

Important topics that were central to the workshop:
- Use of ML algorithms to accelerate rare event sampling
- Use of ML for structural (effective potentials) and dynamical (memory kernels) coarse graining
- Constructing reliable and meaningful mechanistic models for complex rare event (bio)molecular processes and hence improving reaction coordinates

Questions and topics that were addressed explicitly in this workshop:
- What can machine learning do for the rare event community?
- How can we use ML to enhance and accelerate sampling? How does this compare to e.g. biased sampling?
- How can we best apply ML to analyze molecular trajectories? How can we construct meaningful CVs and low dimensional models? Can we use machine learning to find collective variables and reaction coordinates?
- How can we use ML to efficiently and accurately represent effective interactions as a means to accelerate sampling?
- Can we use ML to coarse grain the slow dynamics, i.e. learn memory kernels in the reduced (coarse grained) dimensions?
- Can we automatically identify most important slow/fast degrees of freedom?
- How do we connect to experiments? What are the predictions that ML algorithms can make?

Short summary of key moments (key debates, breakthroughs, etc.)

Each workshop day was focused on one of the following topics:
1. The general problem of rare event sampling
2. ML to accelerate rare event sampling
3. ML to construct reduced models from molecular simulations
4. Fundaments of ML & advanced developments
5. Applications, broader scope and future outlook

After several lectures, each day the topics were intensely discussed in breakout groups. The outcome of this discussion was later presented during a plenary discussion. All participant actively contributed to each discussion. At the end of the week the outcome of the workshop discussion was summarized in a concluding session.

Outcome(s) of the key debates

On combining ML with sampling: "Neural network architecture, training, data collection, etc. must be tailored to the task at hand!" (Eric Vanden-Eijnden)
- architecture: any particularly suited for molecular simulations? Importance of invariances; feature selection
- training: statistical physics to help understand network structures; how do data evolve through the network
- data: rather sparse; adaptive/on-the-fly learning; measure convergence
- task at hand: discovery/evaluation of CVs; definition of states; sampling of transitions; sampling in latent space; predicting long-time dynamics; …
- interpretability: how much physical understanding do we want/need?

"Practical" Issues:
- databases/repositories: creating 'big data', how can we establish this for trajectory data? Availability/applicability of codes; MolSSI QCArchive, plumed nest, ECAM repository
- validation of methods: library of benchmark problems with increasing complexity and for different classes of problems
- method selection: enhanced sampling and ML model
- HPC: efficient use of available computing power; scheduling, data distribution/collection
- education of students: knowledge in chemistry/physics and computer science

Future
- further development of the field in the upcoming era of exascale computing, including the development of efficient and automated workflows for distributed computing
- the field of rare event simulations is still at the very beginning of how to us ML approaches can be used, but many approaches/ideas are currently discussed that will become increasingly important and applicable
- the community should aim to formulate 'grand challenges' to be tackled

Preparation

The workshop was prepared in a hybrid format, with both online and onsite participants. The program consisted of a combination of synchronous and asynchronous strategies. Lectures were synchronous, but recordings could be watched by participants outside of the CET time zone. The spread across time zones also made breakout sessions asynchronous, with people preparing discussion input at different times during the day.

Duration of the workshop and time management

The duration of the workshop was 5 days. Each day had several lectures of 25 minutes and 5 minutes discussion. After each lecture a break was organized to avoid online fatigue.

Short- and long-term plans for follow-up

The short-term plan is to compose a joint paper on the workshop to give the community an overview of what has happened in the field in the past few years.

The long-term plan is to keep this community together, and possibly organize a follow up meeting in 3-5 years.

Lessons learned for future virtual events

Keep time better. Some discussions went well into the breaktime.

Christoph Dellago (Vienna, Austria)
Gerhard Hummer (Frankfurt, Germany)
Jutta Rogal (Berlin, Germany)
Peter Bolhuis (Amsterdam, Netherlands)

FAIR Data for the 'Long Tail of Science'

6 - 10 September 2021 @online

Aims

Data collected from natural populations in the fields of ecology and evolution are essential to our understanding of living systems, and to our capacity to address global challenges, such as climate change. Yet, much needed data synthesis across research groups is challenging, because groups are not well connected, and they use different methods to collect, standardise and manage their data (so called 'long-tail' of scientific data). Transition to Findable, Accessible, Interoperable, and Reusable (FAIR) data is much needed to facilitate synergy between groups and to facilitate increased knowledge potential based on the collected data

Thus, our aims were to: 1) make an inventory of the steps needed to make the long tail of science FAIR and develop roadmaps to achieve synergy between ecological databases; 2) create an interdisciplinary research community that uses the combined power of the data hosted at different databases. We used three databases collecting data on birds (SPI-Birds, MoveBank, Euring) and GBIF as a case-study example to explore challenges and benefits of connected data landscape. We brought together three sets of expert: researchers in ecology, database managers, and e-infrastructure/FAIR experts.

Key moments

Given the diverse community this workshop has gathered, there were many Key moments. For example, many have learned the importance of meta-data to enable FAIR data, distinction between Open and FAIR data, importance of incentives to make data FAIR (including difference in incentives between academic and non-academic communities). A big key moment was the information provided by participants on how to put our subject on the roadmap of (EU) funding programmes, related to FAIR data and infrastructural developments

Outcome(s)

We have identified main obstacles and relevant solution to move towards creating a FAIR landscape for long-tail science. These involve work that each database needs to conduct in order to improve its FAIRness and also work that we need to do as a community. To achieve the latter, we have organized ourselves into three working groups: (1) map meta-data fields and vocabularies of different databases which will form the base for creating a common fields and formats; (2) link to existing standards and vocabularies; (3) identify a number of clear scientific use-cases that would enormously benefit from a connected FAIR data landscape. The latter will be also a base for funding applications to support our future efforts.

ORGANIZATION

The workshop was well organized and ran smoothly despite its online format (which was not originally planned for). We had enough time to talk as a group, but also in smaller break-out groups, which has increased connection between participants. Having the workshop in the virtual environment had some pros and some cons. The benefits were that several participants that otherwise would not be able attend have attended the workshop. The con was that we did not manage to cover as much in depth work on the problems as initially planned. Virtual format restricts time of participation and ability of

participants to concentrate, thus, as one of the participants noticed, we have probably managed to achieve what we would have achieved in three days of in person event.

LORENTZ CENTER (VIRTUAL) SUPPORT

Support from the Lorentz team was excellent.

Antica Culina (Wageningen, Netherlands)
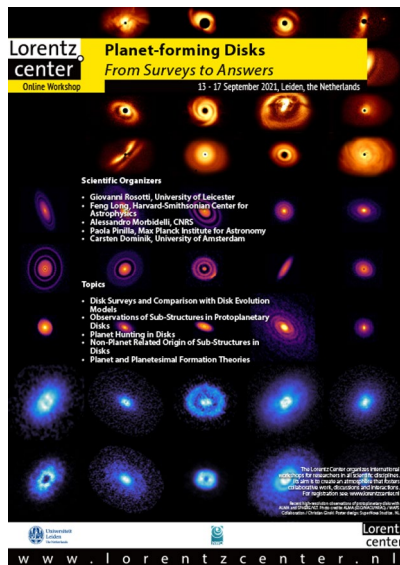**Marcel Visser** (Wageningen, Netherlands)
Cees Hof (Den Haag, Netherlands)
Erik Matthysen (Antwerpen, Belgium)

Planet-forming Disks

From Surveys to Answers

13 - 17 September 2021 @online

Scientific Aims

To discuss the results of most recent observations of protoplanetary disks, in particular imaging surveys revealing sub-structures. Now is a crucial moment to discuss what is the next step for the field, both from theory and observations. We aim to connect a diverse group of observers and theorists to understand what we do know, and what we need to find out next in order to make progress in the field of planet formation and disk physics.

Short Scientific Output

We kicked off the workshop discussing the results of large disc observational surveys. There was a general consensus that this has been one of the most useful uses of the available telescope time, but we also discussed the biases in the observational sample (high stellar masses, local environments, reliance on the continuum) and that future observational campaigns should address them. Unfortunately, even with this large wealth of data our knowledge of a very important disc property, the mass, is still limited. We reached a consensus that there are several techniques with different strengths and weaknesses, and the best way to make progress is to calibrate these techniques against each other, rather than relying on a single technique. Finally, we discussed whether the main driver of disc evolution is MHD winds or viscosity. A strong consensus emerged that, if winds dominate the evolution, they should drive large mass-loss rates, making them relatively easy to detect. One of the next steps to do is therefore to conduct observational campaigns to detect these winds.

We then moved to discussing subtructures. Their detection already at the embedded disk phase suggests early planet formation, which is also supported by efficient theoretical mechanisms, while the survival of early formed planets remains problematic. The optimal spatial resolution for substructure study should be comparable to disk pressure scale height and the interpretation on substructures largely relies on a better handling of 3D disk models. The community urges for publications on non-detection results and more observations on the disk gas content for the kinematics and chemistry.

We agreed that if planets are embedded in disks, they can produce observables such as H-alpha emission and the circumplanetary disk could be detectable (e.g., PDS70). These kinds of observables are urgently needed for a large sample of disks to understand if most of the observed substructures are produced by planets.

In addition, we discussed the entire suite of mechanisms that can produce large-scale structure in disks even in the absence of planets interacting with the disk. These can be classified into: Snowline-related, Magnetic field related, dust-triggered, gravitational instabilities, local hydrodynamical effects and structures caused by the infall of material onto the disk. While there is no foolproof classification system only based on observables, we identified for each of these classes properties that would be characteristic or even uniquely identifying. Not all of these properties are currently observationally feasible. Some require very high-resolution observations, others require significant samples to see systematic effects.

Moreover, we discussed current models for the formation of planetesimals and planets. We reviewed the hydrodynamical instabilities that can cluster the dust into self-gravitating clumps which may then lead to the formation of planetesimals, with a preferential size of 100km. We also discussed two modes

of formation of planets, via planetesimal-planetesimal collision or the accretion of dust by a planetary seed, assisted by gas drag. We also had a very complete review of the observations of the PDS70 system, the only confirmed planetary system observed embedded in a protoplanetary disk. We discussed which observations can bring definitive evidence for the formation of the first planetesimals in a few specific rings or sparse everywhere in the disk, and for planetary growth proceeding predominantly from dust accretion or planetesimal accretion.

Organization

All the contributions to the workshop (invited and contributed talks and posters) were pre-recorded and uploaded two weeks before the workshop. We encouraged the participants to watch the uploaded contributions beforehand but we started each live session with a summary of the contributions - this idea attracted positive comments from the participants. During the live sessions held on MS Teams we had mainly discussions about the "big questions" in the field, focusing on what we can now consider as "known" (for which the debate is essentially closed), what is believed to be true but a definitive evidence is still lacking, and what is still unknown and requires new steps in theory and/or observations to be elucidated. Each session had two discussion leaders and for each day we collected a table with the "known", "believed" and "unknown" topics in each field. Part of the discussion was broken in small parallel sessions, which were very active and triggered several debates. Several participants communicated to us that this was a very fruitful way to discuss different questions and that they enjoyed the workshop.

Points for improvements for the Lorentz center team

Overall we were very satisfied with the support received which greatly contributed to the success of the workshop. The only complaints we had from the participants were that logging in MS Teams was sometimes very difficult (with strange error messages), but we understand this is a limitation imposed by Microsoft and outside the control of the Lorentz center.

Giovanni Rosotti (University of Leicester, UK)
Feng Long (Harvard-Smithsonian Center for Astrophysics, USA)
Alessandro Morbidelli (CNRS, France)
Paola Pinilla (Max Planck Institute for Astronomy, Germany)
Carsten Dominik (University of Amsterdam, The Netherlands)

Best Practices & Tools for Diffusion MR Spectroscopy

20 - 24 September 2021@Oort / hybrid

Description and aims

The aim of the workshop was to start breaking the boundaries between the current group of DW-MRS developers and the wider scientific community, by making DW-MRS more accessible to the MR research community at large.

The aims of the workshop were:

1. Launch a user-friendly open-source platform that will be used to process, analyze, and model experimental data acquired at different sites/vendor scanners/magnetic fields.
2. Initiate a data repository attached to the open-platform to widen the accessibility of DW-MRS data. It will also contain a description of acquisition protocols and contact of researchers working in the field.
3. Write a 'consensus paper' summarizing practical principles of DW-MRS and providing protocol recommendations for different users' goals, with a description of the novel open-source platform

Tangible outcome

The workshop was successful to strengthen the community and lay the basis of our three aims above-mentioned. The pregame results will hopefully turn into an abstract for the ISMRM (main conference in our field). The sessions yielded great discussions at the core of the consensus paper. The sub-teams for the consensus paper were formed, and we aimed at a submission within 6 months. The user-friendly open platform is not launched yet, but hopefully will be in the coming months. However the initial foundation were performed (first demonstrations of two open-source pipelines were done during the workshop). We agreed that a full standardization of our methods wasn't desirable, but we think we can have a simple and robust pipeline for newcomers who want to use DW-MRS in its most basic outfit. Harmonization of our methods could be helpful (main steps + best algorithms if any), and they will be outlined in the consensus paper.

Format of the workshop

The workshop was hybrid, with 45 attendees. About 17 participants were present onsite. The online participation was a bit more challenging; we usually had a core of about 10 attendees online, and some other attendees popping-up from time to time. It lasted 4 full days (Monday afternoon to Friday morning), and was hybrid the whole time, but we had put the most important sessions in the afternoon, so that our participants from the US could join (we had a few).

The Teams environment proposed by the center was used for the hybrid interaction. In the end the best hybrid interaction was when everyone was in the big room (better equipment + better interaction in general). The channel management was the bit that could be improved: many online participants were lost among the different channels on the first day, and for the remaining of the conference in the end, we functioned with 3-4 channels.

Other comments

Many thanks to Linda and everyone who helped organize this workshop, it was a super great experience.

Chloé Najac (Leiden, NL)
Clémence Ligneul (Oxford, UK)
Francesca Branzoli (Paris, FR)
Marco Palombo (Cardiff, UK)
Julien Valette (Fontenay-aux-Roses, FR)
Itamar Ronen (Leiden, NL)

The Politics of Climate Engineering
Arenas, Actors, Timescales
21 - 24 September 2021 @Snellius / hybrid

The workshop held in September 2021 at the Lorentz Center in Leiden took place in hybrid form, involving 13 participants sitting in the Snellius building and 7 participants who joined online. It represented the continuation of a conversation initiated in September 2020, where we had invited scientists and policy makers to outline a research agenda on the Politics of Climate Engineering. The outcome of this first meeting (see Annex 1) identified a need to understand the political dynamics around climate engineering in concrete, real-life settings.

Aims for the meeting

Our approach to the hybrid workshop in Leiden was to discuss and work on a set of case studies that examine concrete arenas, actors, and/or timescales that are at play in the emerging politics of climate engineering. Participants were asked to prepare draft articles (on cases of their choice) in advance of the workshop, which we inductively divided into four sessions: Expertise, Civil Society, Markets and Public Policy. Each session was chaired by a different workshop participant, and each paper within the session was allocated to a discussant who both presented the paper and asked questions of the author, before opening up to questions from the plenary. Chairs were responsible keeping time and drawing out overarching commonalities and insights from discussions within the session, as well as across sessions. The aim of this exercise was to find patterns and commonalities across the different case studies, as well as blind-spots or issues that participants were not previously aware of and that provide ideas for future inquiry. For each participant, the discussion provided helpful insights on how to take their work further. For us scientific organizers, it served as a way of identifying promising cases to include in an edited volume that we plan to pursue as an output of this workshop.

Key moments (key debates, breakthroughs, etc.)

Our conversations covered many different dimensions, but a few key insights are outlined below:

1. *Seeing both climate engineering expertise and public contestation as spectacle.* Drawing insights from the sessions on expertise and civil society, we realized that actors who are publicly involved in the debate around climate engineering (primarily scientists and civil society organizations) engage in a kind of public spectacle. Legitimacy, arena and timing are key in staging this performance.
2. *Seeing the power of 'backstage' climate engineering politics and actors outside of the limelight.* Drawing insights from the sessions on markets and public policy, we realized that there are powerful actors involved in shaping governance for climate engineering that are not commonly discussed, including corporations, standard setters, and insurance companies.
3. *Seeing the importance of institutional fragmentation and the ruling of the technical over the political.* Drawing insights from the sessions on expertise, markets and public policy, we recognized the role that existing institutional structures have in shaping governance around climate engineering, including some structures (like carbon markets) that almost seem to have a life of their own.
4. *Seeing the conflict between a global idea/narrative and the local situatedness and worldviews of different actors.* Drawing insights from across the four sessions, we recognized a recurring mismatch or conflict between the global, cosmopolitan and scientific narrative of climate engineering, and the local situatedness of actors who come with their own worldviews, experiences and perspectives.

Outcome(s)

At the end of the week, all participants had a lot of feedback to develop and finalize their case studies (under the thematic umbrella of the workshop). We as scientific organizers of this workshop will continue working with the topic in the form of an edited volume.

Other comments

Our format worked very well to get the discussion going. Many participants also commented positively on the fact that we discussed very preliminary (as opposed to rather polished) texts, which created a feeling of informality and trust, and made it possible to really work on and shape the submitted texts during our time together.

Preparation

In our preparations of the workshop, we had two organizational goals:

a. That all participants would be well prepared to contribute insightful information to the discussion.
b. That we as scientific organizers could keep an overarching view of the deliberations as they unfolded.

To realize these goals, participants were asked to submit draft papers one week before the event. Roles of chairing sessions and discussing papers were divided amongst the participants. Note-taking and technical facilitation was taken care of by our four student participants. In this way, everyone had an important task and contributed to shaping the workshop, while we as the scientific organizers could keep an eye on the bigger picture and react to any immediate organizational concerns.

Duration of the workshop and time management

As noted earlier, the workshop included two meetings: one 'kick-off' event of three afternoons (3hrs each) that took place online in September 2020, and the hybrid event that took place over four days, from Tuesday lunch time to Friday lunch time in September 2021. Tuesday, Wednesday and Thursday of this hybrid event were dedicated to scientific content and discussions, while Friday morning offered a city tour of Leiden (see Annex 2). The scientific content of the workshop was divided into four sessions, each containing two or three papers and a session reflection. In these sessions, paper-discussion slots were usually 1hr long, with 15min breaks in between and divided by a long lunch break of 2hrs. At the end of the workshop, we had one session to collect overarching insights and discuss outlets for a possible collective publication. Tuesday, Wednesday and Thursday were concluded with dinner together.

Short- and long-term plans for follow-up

The group of workshop participants will stay in touch on this issue in a number of different formats:

a. A sub set of participants is co-authoring a journal article, based on the insights from the online kick-off.
b. The scientific organizers will pursue an edited volume including some of the case studies discussed at the workshop.
c. Following the first kick-off event, a working group on 'The Politics of Geoengineering' was set up under the umbrella of the Climate Social Science Network. Several workshop participants are part of this group and will continue collaborating and networking in this setting.

Lessons learned for future virtual events

- The coffee break software provided to online participants was not used. In future hybrid events, it would be nice if online participants could somehow be integrated into the onsite coffee breaks, e.g. by taking them 'along' on a laptop into the coffee break area.
- Visual forms of note-taking like Miro or another form of graphic facilitation would facilitate easier navigation of insights.
- It was difficult for online participants to see on-site participants, as the camera captures the entire room. More advanced technical infrastructure (?) might help. Although the sound seemed to work quite well.

LORENTZ CENTER (VIRTUAL) SUPPORT

The support was excellent, thank you so much! One point of improvement might be to minimize the amount of emails sent, as this could facilitate the finding of relevant information.

Dr. Ina Möller (Wageningen, Netherlands)
Dr. Julia Schubert (Speyer, Germany)

Artificial Intelligence for Natural Product Drug Discovery

27 September - 1 October 2021 @Oort / hybrid

Aims for the virtual meeting

The main aims of the workshop included:

1. Exchange of ideas and improved communication between the fields of omics-based natural product discovery and computational drug design
2. Discuss advances in machine learning methodologies and how they could be applied to the connect and integrate approaches from the two fields to achieve new synergies.

Key moments (key debates, breakthroughs, etc.)

The breakout sessions were a highlight of this workshop as they enabled targeted group discussions and resulted in more active interactions between on-site and online workshop participants. Several key breakthroughs came from brainstorming sessions. One memorable brainstorming session tackled the bottleneck of 'lack of high-quality training data' by identifying key incentives or so-called 'carrots' to promote database contributions from the scientific community to amass quantities of training data necessary for AI methods. Other specific discussion points included methods of chemical featurization, algorithmic design, data and metadata standardization, biological activity prediction, and how to connect heterogeneous types of data (including omics data and 3D structural data) to predict natural product functions and mechanisms of action.

Outcome(s)

The final day of the workshop included a 24-hour writing marathon with continuous work on a group manuscript through the combined effort of participants around the world. This was absolutely a highlight! In a very limited amount of time, a full draft with >10,000 words was written jointly by dozens of scientists around the globe.

Another outcome was the interface between two disciplines resulting in knowledge transfer. There was a significant educational outcome from this workshop since participants learned from each other about new topics outside their own research fields.

Preparation

The organizing committee included five researchers (Medema, Robinson, Linington, van Westen, Hirsch) under the leadership of Prof. Medema. In total the organizing committee met virtually ~20 times over a period of 8 months prior to the conference. In addition email and Google Documents were used extensively to develop the provisional program, identify delegates to invite to the workshop, and assign moderators and session chairs.

One challenge faced by the organizing committee was that, even with considerable effort from the organizing team, it was difficult to create a delegate list that had perfectly equal representation of both genders. In several cases, invited speakers could not attend but nominated other lab members of the opposite gender. This created some complications given the small number of participants. The hybrid format was helpful with this issue, because it provided some flexibility to increase participant numbers, and to offer opportunities to a broad diversity of participants.

Duration of the workshop and time management

The workshop lasted from Monday until Friday (27 Sept - 1 Oct). The schedule was split between time for small group discussions and short talks followed by ample time for questions and plenary discussions.

Short- and long-term plans for follow-up

As mentioned above, workshop participants from around the world contributed to a collaborative manuscript targeted for submission to Nature Reviews Drug Discovery. After several rounds of editing by workshop participants following the workshop, we as organizers are now compiling the different sections of the manuscript for submission to a scientific journal in December.

In the long-term, we have built a strong network of researchers bridging the scientific disciplines of natural products and drug discovery which we anticipate will result in multiple collaborations. We look forward to further strengthening these connections at future meetups and workshops as well as through publications.

Lessons learned for future virtual events

The hybrid format worked remarkably well apart from a few technological glitches. One major takeaway from this event was that the schedule was a bit too tightly packed and it would have been wise to build in more time for coffee breaks and unstructured social interactions (as Anna of the Lorentz Center had wisely advised us).

With only one laptop and camera, we also had to pay close attention to where the camera was pointing during the discussion sections to make sure that the online participants were fully involved in the process. Having a split screen or a second camera to allow simultaneous views of the presenter and the audience would have been useful.

LORENTZ CENTER (VIRTUAL) SUPPORT

Comments/points for improvement for the Lorentz Center team.
We would recommend always connecting the workshop laptop on-site with an ethernet cable as the WiFi can be unreliable.

Marnix Medema (Wageningen, the Netherlands)
Serina Robinson (Zürich, Switzerland)
Roger Linington (Vancouver, Canada)
Anna Hirsch (Saarbrücken, Germany)
Gerard van Westen (Leiden, the Netherlands)

Language development, diagnosis and assessment in school ages (6-16)

next steps in research and practice

27 September - 1 October 2021 @Snellius / hybrid

Scientific aims

The aim was to establish a new way of working on the identification of language needs in children in the age range of 6-16, by integrating workforces from Linguistics and the Health and Education sciences. The workshop, which was international, interdisciplinary and intersectoral, brought together non-academic professionals at the front line of identification and intervention of language needs (medics, speech and language therapists, teachers) with experts in detailed description and analysis of language development (linguists, speech and language therapist researchers, educational researchers) to identify gaps in knowledge of the development of language abilities in the school years in a variety of populations (typical developing, deaf, children with language impairment, children with intellectual impairment) from different countries, and determine a pathway for linguistically-based research on language diagnostics and interventions for language delays and impairments in the school age years (ages 6-16).

Key moments

Each day of the workshop had a theme and an intended output identified from the start. A day was organized around a set of short talks, two blocks of discussion in small interdisciplinary breakout groups and a plenary discussion - both in hybrid format - to gather the views of the day and construe the output of the day. The themes of the workshop were:

- Language needs in the context of education and health,
- Language development during the school years in typically and atypically developing children,
- Language assessment and academic performance,
- Language intervention and support,
- Raising awareness and affecting policy.

Outcomes

The participants engaged extremely well during the breakout groups and plenary discussions, and the joint work led to the following outcomes:

- Improvement of the mutual understanding about the value of integrating expertise from Linguistics, Language Health Sciences and Education on research and practice agendas around language needs,
- Identification of concrete next steps to improve diagnosis and assessment of language needs,
- Creation of an interdisciplinary academic network enriched with stakeholders (professionals, parents and professional bodies) to establish a transnational research agenda,
- Draft of a Manifesto to raise awareness across Europe and beyond on language needs as an invisible disability that still awaits adequate recognition,
- Follow up plans to finalize the Manifesto and continue the shared research agenda.

Organization

Time management went very well overall, and, thanks to the detailed preparation before the workshop, the aims were achieved at the end of the four days and a half. The hybrid format worked well, except for major drawbacks suffered on Ms Teams most days. We happily take away several insights for organizing future hybrid events (hybrid works! the chat is an additional, parallel great source of discussion and information exchange), as well as for creating an engaging workshop format (short talks, breakout groups with specific topics and questions for discussion, discussants for the general discussions, and last but not least the open space technology for setting the stage on the first day).

Lorentz Center (virtual) Support

Comments/points for improvement for the Lorentz Center team.

We did not have a completely satisfactory experience on Ms Teams and on two occasions we needed to migrate the workshop to another platform on the spot, which generated confusion and gave the impression of lack of preparation for contingencies.

The issue that might have been at the root is our need to wait to be given the final confirmation for the workshop, since this delayed the registration of participants.

Maria J Arche (London, UK)
Angeliek van Hout (Groningen, NL)
Karen Bryan (York, UK)
Ellen Gerrits (Utrecht, NL)

Communicating Science in a Democratic Society

Participation, transparency and accountability of scientific practices in democracy

30 September - 8 October 2021@Snellius / hybrid

Aim and Description

The relationship between society and science is constantly evolving, it requires constant care and re-evaluation, and is very much impacted by factors such as traditional media, social media and geo-politics. The expertise and expert opinions of scientists are not seldom challenged by factions giving priority to alternative sources of information. In public health issues, for example, the public is confronted with policies drafted after scientific evidence which in itself is not conclusive and subject to change, as knowledge is accumulating in time, which on its turn leads to revision of policies. This leads to erosion of public confidence in science, especially if the political decision is perceived as "not working". There are cases in which it is difficult to draw a line between science and politics, and communication between science and society is a very crucial issue.

The overall goal of this workshop was to investigate how to improve the quality of the relationship between science and society, focusing on the issue of communication.

The recent pandemic of COVID-19 is the last and most dramatic example of a critical relationship between science and society. We wanted to compare this example with the public communication of animal research, which is a more established example with many initiatives having been developed over the years to try to improve the situation.

Therefore, the discussion moved from two "case-studies": the shift in relations between science, politics and society during the Covid-19 pandemic and the use of animals in research. Gathering experts (both academics and professionals) in communication of science, animal research, philosophy of science and ethics, law and law-making etc., the case studies have been used to identify and highlight the critical areas in the communication contributing to the 'conflict arising', and to develop alternative ideas about establishing a constructive dialogue through communication of science towards improving the relationship between science and society.

Outcomes

Presented plans will be developed in the coming months. In particular:

i.   At the time of the completion of this Report, we are drafting an abstract for the ESOF 2022 meeting in Leiden next summer. The idea is to propose for a roundtable exposing some of the major topics which came out from the workshop, leaving ample space for discussion with the public.
ii. We have established contact with a potential sponsor to organise another workshop in Rome in 2022 on these topics. The event will also include an interaction with local high-schools, trying to put into action some of the conclusions from the workshop, in relation to communicating science to students. The event will potentially include some of the participants of the Lorentz workshop.
iii. We have composed an index for a multi-authored paper, based on the main ideas developed during the workshop.

"Aha" moments

The participants of the workshop organised themselves in different working groups. These working groups, independently, underlined a series of shared concerns, which should be taken into account when revisiting the way to communicate science to the public:

- Communication must include an engaging narrative. Just fact and figures are not functional to open dialogue;
- The narrative should include that scientific research is trial and error. A journey with progress, and setbacks.
- The important issue is to stimulate dialogue. If you are not willing to leave your position you are not a participant of that dialogue;
- The scientist should be made comfortable to step down from their pedestal and to allow to present vulnerability;
- Vision of a shared vision by science and society;
- Public understanding science: What about the scientists understanding the public?
- Since most of the science is funded by the public, there is a 'moral' responsibility by default irrespective of the topic;
- Distinction between convincing and trying to getting closer together;
- Education research learns that there is a window of opportunity to be successful in engaging a person; outside of this window other interests take over;
- Educate the audience to know where to find information and how to appreciate it;
- It is not only dialogue and messaging but also the willingness to accept that change may be necessary;
- Understand that different stakeholders are at different levels of thinking, communication.
- Apply the "Big ears – Small mouth" model: when engaging in communication just listen more and talk less. Ask people about their curiosity and concerns first, before presenting your case.
- The concept of 'academic freedom' which is sacrosanct in many, if not all, research establishments, could be problematic for the public, as it could be perceived as scientists could do anything, without considering moral, ethical angles or potential downsides, risks, and negative consequences Language is important. The use of some words by scientists may have different meanings to the public. For example, 'theory' has a defined meaning in research terms but could be perceived as meaning 'a hunch' or speculation by the public.

Organization/Format

We gathered together animal researchers, social scientists, biologists, jurists, journalists, philosophers and decision-makers to crossover ideas, establish common vocabularies and meanings. The workshop was characterised by invited talks (mainly in the morning), followed by four working groups (WG), the same composition for the length of the workshop, which discussed the different aspects raised by the morning lectures.

Other comments

We ran the workshop in a hybrid format. Despite the excellent technical skill by the staff at the Lorentz Center, few of the participants online were less present than expected, whereas others were very committed and present all of the time. However, the Center was able, as usual, to create a very stimulating and, at the same time, relaxing atmosphere to help developing discussion. The public lecture, as well as the social dinner, and the co-presence at the same hotel, were all ingredients to facilitate the continuous interaction among the participants.

Silvia Bencivelli (Rome, Italy)
Gail Cardew (London, Great Britain)
Simone Pollo (Roma, Italy)
Jan-Bas Prins (Leiden, The Netherlands/London, Great Britain)
Augusto Vitale (Roma, Italy)

Magnetohydrodynamics
Physics for the 21st Century
11 - 15 October 2021 @Oort / hybrid

Description and aims

Magnetohydrodynamics (or MHD) theory is at the heart of solar physics and controlled fusion research. It even connects laboratory studies of plasmas to the dynamics associated with accretion processes and jet flows about black holes. It mathematically describes the nonlinear complexity of turbulence and governs magnetic reconnection, a dynamic reshuffling of the intricate connectivity between the plasma and the magnetic field lines. MHD explains how our Earth's magnetic dipole operates and protects us from the supersonic solar wind, through generating our magnetosphere. Our current society, relying heavily on GPS and telecommunication, is vividly aware of the havoc that can result from a powerful solar flare, and is rightfully investing in MHD-based predictive efforts for space weather alerts. Plasma physics and MHD modeling are at the forefront of High-Performance Computing efforts, and already demonstrated that one can model Sun-to-Earth solar coronal mass ejections faster than real time. Similar breakthroughs have been realized in modeling solar prominences, which condense through radiative losses in the million-degree solar corona. More energetic processes, incorporating Einstein's theory of special and general relativity, require accounting for the full, unmodified set of Maxwell equations, and relativistic MHD successfully reproduced multi-wavelength views we share on past cosmic explosions, such as the Crab pulsar wind nebula, or on the surroundings of black holes, recently made visible by the Event Horizon Telescope project. The time is ripe to bring these cutting-edge disciplines together, and prepare for the next generation of models in all these fields: those where microscopic and macroscopic scales actively interact. This workshop aims to stimulate interaction and inspire new avenues for interdisciplinary research, which can lead to future joint publications between invited team members.

Vivid discussion arose on the differences between laboratory fusion research (staying as closely as possible to quiescent equilibrium states) and astrophysical plasmas where explosive phenomena are a rule rather than an exception. Several sessions were devoted to instruction and exchange of computer programs on spectral methods to solve outstanding problems in waves and instabilities. Different challenges posed by a wide variety of unsolved problems in the different fields were formulated and collaborations to solve them were initiated.

The most exciting outcome of the workshop was that MHD turned out to have become central to the description of most astrophysical plasmas, from the Sun to plasmas about black holes: methods originally developed for the field of laboratory fusion research are now applied to all phenomena in the Universe!

Organization

The format of the workshop was hybrid (25 on-site, 25 online participants).
Remark: Microsoft "Teams" was exploited for online participations. It caused quite some poblems for participants with a Macintosh laptop.
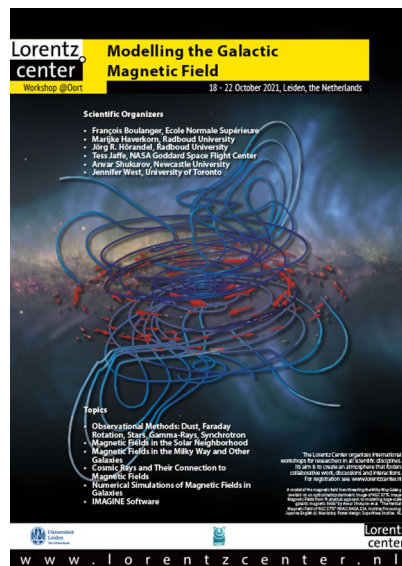
Rony Keppens (Leuven, Belgium)
Stefaan Poedts (Leuven, Belgium)
Hans Goedbloed (Eindhoven, Netherlands)

Modelling the Galactic Magnetic Field

18 - 22 October 2021 @Oort / hybrid

Description and aims

Our Galaxy, the Milky Way, contains a magnetic field with a complicated morphology. Because of the complexity of the field and difficulties in measuring magnetic fields, modelling this field and revealing its origin is an extremely daunting task. However, a realistic Galactic magnetic field (GMF) model would be extremely rewarding: magnetic field knowledge is essential for understanding the Milky Way's ecosystem and evolution. Also, it would elucidate the origin and evolution of galactic magnetism. Lastly, such a model is essential for extragalactic studies for which the GMF is an interfering foreground; in particular, a realistic GMF model would finally allow extremely energetic charged cosmic particles, named Ultra--High Energy Cosmic Rays (UHECR) to be traced back through space in order to discover their sources in the Universe. Therefore, this endeavor can only be undertaken through collaboration of experts in Galactic magnetism, cosmic-rays, and (bayesian) modeling methods, which was one of the aims of the workshop. Besides the scientific exchange, the meeting aimed at making progress on the development of the software suite IMAGINE, which is a platform to model Galactic magnetic fields.

Tangible outcome

Significant progress was made both in research and software development:

- Several immediate science cases to test the current software were defined
- Building magnetic field model library to include in IMAGINE and in cosmic-ray propagation code CRPROPA

Research projects started:

- Non-gaussian characterization of the magnetized ISM, using wavelet scattering transforms to define components of the Faraday sky
- Use of magnetic field models through IMAGINE to model large-scale structures in the sky as filaments along the Local Bubble wall

Several papers/projects that were in progress received useful input after presentations and discussions.

Organization

The workshop has been conducted as hybrid meeting with colleagues being present at the Lorentz Center in Leiden as well as joining remotely by video conferencing. More than 60 participants were attending the workshop and were contributing to intense discussions. Various topics have been discussed, including observational methods, such as dust polarization and Faraday rotation measurements, analyses using diffuse gamma rays and radio emission, magnetic fields in the solar neighborhood, magnetic fields in the Milky Way and other galaxies, cosmic rays and their connection to magnetic fields, numerical simulations of magnetic fields in galaxies, and the further development of the IMAGINE software framework. The successful workshops marks an important step forward towards a better understanding of the Galactic magnetic fields.

This workshop devoted roughly half of the time to discussions, with a focus on defining ways to move

forward with projects and how to best utilize the software infrastructure. The IMAGINE consortium is organized into groups of researchers are working on specific sub-projects, and the discussions were led by the team leads on these projects. The discussion sessions included:

What can you do with IMAGINE?
Faraday rotation and helicity as an additional observable Statistical characterization of the magnetized ISM
Starlight polarization as a tracer and the connection to synchrotron emission Using Fast Radio Bursts to gain information about the GMF
Galactic cosmic ray distribution and connecting CRPropa to IMAGINE
The role of supernova remnants and their magnetic field connection to the Galaxy

The team leaders presented summaries of these discussions. Several papers are in preparation and these discussions have contributed to the advancement of those publications. This meeting at the Lorentz Centre has significantly contributed to the momentum of this project and we will carry that with us as IMAGINE continues to move forward with its virtual seminar series and the great variety of projects currently underway.

François Boulanger (Paris, France)
Tess Jaffe (Baltimore, US)
Marijke Haverkorn (Nijmegen, Netherlands) Jörg R. Hörandel (Nijmegen, Netherlands)
Anvar Shukurov (Newcastle, UK)
Jennifer West (Toronto, Canada)

The Scientific Conference
Past, Present and Future
18 - 22 October 2021 @Snellius / hybrid

Short description of the aims for the (virtual) meeting

This workshop was dedicated to discussing the dynamics of international conferences as phenomena vital to scientific life. The point of departure was the historical research on conferences that the organizing project group had done over the previous two years. Its results served as a kick-off point for discussing the many functions, aspects, and purposes of conferences with various interested parties: scientists (as conference participants), conference organizers, and people from Science and Technology Studies interested in the conference phenomenon. The aim was to advance current debates on the future of conferencing and to inspire new historical questions about conferences.

Key moments (key debates, breakthroughs, etc.) and outcomes

During the first two days we had five trialogues where outsiders commented on the project members' historical findings – not with an eye on giving feedback, but in order to articulate common or differing interests. These discussions were very effective in bringing out both. What became apparent here were not only the varying viewpoints but also what enormous differences there are between various academics disciplines in terms of what conferences are seen to be good for. Astronomers, literature scholars, geologists, and historians do very different things at conferences – and use them for widely varying purposes. In the end the, the historical work stretched everyone's imaginations of what else had been possible at conferences, whereas the work of conference go-ers, organizers and observers inspired historians to ask new questions, e.g. on the institutional barriers to conference participation and the tedium of conference life.

During the last three days, the project group held a workshop with an eye on advancing its own papers, which was also immensely productive. The project members produced a response to reviews on their special issue proposal (which later turned out successful in securing it), collected, processed, and redistributed feedback on all of their papers, and rewrote their abstracts on the spot.
All in all, the entire workshop worked out very well in terms of establishing new connections and energizing the project which had suffered from lack of in-person meetings for almost two years. This then was a meta-insight: in-person meeting really makes a difference.

Preparation

The workshop had been long in the making. Already planned in the project proposal phase (2018), it became more and more concrete in the course of 2021. Feedback from LC staff was invaluable.

Duration of the workshop and time management

The workshop took the full five days. At the start that felt like a lot of time, but we needed every minute of it. The week was exhausting and very satisfying.

Short- and long-term plans for follow-up

Short-term: continuing to partake in current debates on the future of conferencing (at the HSS Annual Meeting 20 November, through op-eds and exhibitions – e.g. Science Museum London, April 2022). Long-term: publishing a special issue of the British Journal for the History of Science; plans for a follow-up project.

Lessons learned for future virtual events

Hybrid is not ideal, but still workable. We would not have wanted to be without our online participants. A better room microphone might help.

Comments/points for improvement for the Lorentz Center team.

LC support was incredibly effective: always calm and available and solution-driven. It is hard to think of anything that could be improved. Perhaps the format of the financial organization (money streams) was a bit tight, but then again we are an unusual project with funds coming from so many different national sources.

Sven Widmalm (Uppsala, Sweden)
Jessica Reinisch (London, UK)
Charlotte Bigg (Paris, France)
Geert Somsen (Amsterdam, the Netherlands)

Computational Mathematics and Machine Learning

1 - 5 November 2021 @Oort / hybrid

Description and aims

In this workshop, we addressed the following two important questions:

(1) How machine learning has already impacted and will further impact computational mathematics, scientific computing and computational science? (2) How computational mathematics, particularly numerical analysis, can impact machine learning? The aim of this workshop was to formulate a plan for future developments within the area of computational science and engineering (CSE) making use of machine learning techniques.

Tangible outcome

We have succeeded in all our aims. The workshop was oversubscribed and triggered an enormous amount of interest. There were very fruitful discussions leading to several new insights. An extensive white paper will be produced before end of 2021 to summarize all issues and findings, and plans are being made to submit several European project proposals in 2022.

Scientific breakthroughs

This was one of the first initiatives of this kind in the emerging field of scientific machine learning. In 2019 and 2020, important reports were published in the USA[1]. Online keynote speakers from the USA, George Karniadakis, Petros Koumoutsakos and Karen Willcox, discussed recent developments. European keynotes like Erik Bekkers, Stéphanie Allasonnière and Carola Schoenlieb, presented many novel and ground-breaking ideas. Subsequent discussions at the workshop triggered potential breakthroughs and new ways to cooperate (in respect to "challenges"). Further work is needed from our side to sustain the momentum.

"Aha" moments

An "aha moment" for us was the realization of the enormous prospects of machine learning for our field. But also that a lot of deep mathematics is needed to reveal and explain all secrets, including the incorporation of physical constraints and properties like symmetry.

Organization/Format

The organization and setup was regarded by everybody as excellent. There were quite some keynote talks and contributed presentations, shedding many different lights on the matter. The topic of the workshop was addressed for five different areas, and we had discussions for each of these. During the dinner, the booklet ''Mathematics: key enabling technology for scientific machine learning'' was officially presented. Many are interested in a follow-up meeting as well as follow-up actions like proposal writing and joint projects.

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1   https://www.osti.gov/biblio/1478744 and https://www.anl.gov/ai-for-science-report

The mix of online and onsite talks provided no problems due to the excellent facilities as well as the flexibility and support by the staff of the Lorentz Center.

Wil Schilders (Eindhoven, The Netherlands)
Simon Portegies Zwart (Leiden, The Netherlands)
Peter Maass (Bremen, Germany)
Véronique Maume-Deschamps (Lyon, France)
Weinan E (Princeton, USA)

Speech as Personal Identifiable Information

1 - 5 November 2021 @Snellius / hybrid

Description and aims

Speech and Language Technology (SLT) has become an essential part of our digital society. The automatic processing of speech data (e.g., transcription of what-was-said or biometric recognition of who-spoke) is often beyond the reach of end-users. Cambridge Analytica (2018) is giving us merely a pre-taster on the capabilities to subvert safety measures and infringing upon the privacy of end-users. In 2019, the International Speech Communication Association (ISCA) formed the Special Interest Group "Security and Privacy in Speech Communication" (SPSC). Intended as an interdisciplinary platform, the SIG fosters exchange between leading industrial and academic players with the goal to reach standards and procedures that protect the privacy of the individual in speech communication while providing sufficient means and incentives for industry to exploit future innovative services. Through speech and language, humans interchange all sorts of information, also personal identifiable information (PII). We seek to bridge between usability, SLT, policy & governance, and cybersecurity to build a common understanding and identify overarching interests, challenges, and pathways to solve these. The main objective of this workshop is to foster community building and to develop its roadmap.

Tangible outcomes

We created a report of activities during the event, such that communicated knowledge is not lost, and future dialog can follow-up efficiently. We created two working groups, one on 'Branding/Awareness' and another one on 'Common Understanding'. Students took leading roles in their conceptualisation, design, and coordination. The working groups re-adjourn in February 2022. Ideally, active working group members will co-author open-access publications to serve as guidance and roadmap. Furthermore, a new effort was started which is in synergy to the ISCA SIG-SPSC. However, the building of bridges across disciplines and between users and commercial developers of speech technologies and academia requires a focused effort complementary to that of existing special interest groups within the speech community. It was further agreed that the effort required is both urgent and will remain on-going for decades to come. With an eye firmly fixed on the sustainability of future effort, the participants agreed that they would contribute to the creation of a new forum which would gather specialists from across the entire spectrum of users, developers and researchers who may be interested in Privacy, Security and speech as personal identifiable information. As a first step towards maintaining the impetus created by the Lorentz Workshop the participants agreed to launch a series of annual events, lasting 2-3 days, which will be known as the International Forum for Speech as Personal Identifiable Information (IFSPII) and would eventually progress from by invitation only to open call.

Scientific breakthrough

We realised that awareness and a common understanding are crucial—the problem at hand is complex and reflects the very nature of human communication, in all its varieties and aspects for Privacy, Security and speech as personal identifiable information. A new community must build as an ecology of ecosystems, where mutual nourishment is key to success and societal/institutional competitiveness will burden us. High-level themes are: trust concepts, interface transparency, participatory and anticipatory design, security & privacy solutions (methods, measurement, trade-offs), code of conduct, human rights, and raising awareness. Future events and meetings are to come.

Aha moments

Empowering systems thinking will become existential in multi-disciplinary communities that desire to be productive. The roadmap can also be realised in the form of a permanent secretary for constant dialog across fields and stakeholders. We need to learn from intercultural communication: awareness of our own (cultural) biases to understand differences in high and low context, when we express our methodology and terminology to varying degrees of field dependence. Technological and legal definitions of same words are inherently different perceived by the communities (much more than the in-fights each community has). When students are given responsibility to create, design, and develop (leading) community building, observing their energy is refreshing.

We started on Monday with state-of-the-art presentations: human factors in speech interaction, speech for non-experts, law and governance affecting speech and language processing. These introductory presentations were intended to establish a common basis for interactions between the different communities. On Tuesday, we discussed the current progress on speech anonymisation and today's & future potential for invasiveness of voice profiling technologies (for now, anonymisation remains an aspiration). Wednesday featured talks from security & privacy experts , unravelling how speech technology can be exploited and how challenging it is for the cryptographic community to provide viable solutions for speech technology in the holistic context of its operations landscape and computational needs. The last talk of the day was given by representatives of the Dutch police on 'Making speech stuff that police can use', after which the on-site participants enjoyed a boat tour and a fabulous dinner. On Thursday morning, the same theme was pursued by the French police, on `Use of speech technologies – the Law Enforcement perspective`. The afternoon session featured usability views on security and privacy of acoustics and how para-linguistic and extra-linguistics fields within speech are able to profile, yet could also provide remedy for security and privacy when it comes to speech. The last workshop day started with a talk raising the question—'Between terminology and methodology: bridging the communication gap between disciplines?' Then, we brainstormed on common understanding, revisiting our experience during the week, and bringing to paper how to move ahead. Participants were assigned a roadmap for the workshop and participants took future responsibility.

During the workshop, we conducted two surveys ('awareness' on Monday and 'next steps' on Friday) as well as questionnaires to stimulate thoughts on four use cases (Tuesday to Thursday; smart speakers, health assistance, language learning apps, and VoiceBots). We organised three panels: 'Can voice be anonymised?' (Tuesday); 'Transparency in Voice User Interfaces' (Thursday), and 'Reaching a common understanding' (Friday).

Lorentz Center (virtual) Support

The Snellius venue provides ample breakout rooms and was ideal for us as a small group. Hybrid groups were a great activity to link on-site and online participants. Live feedback on sound (loudness, clarity, …) for on-site participants would have been a great tool, so speakers could adapt if being unintelligible for online participants. Throughout, Linda was key to a successful event. Thank your for all the support, and thank you as well for recommending Verboden Toegang, an excellent choice for a restaurant, and the boat tour through the many low bridges in Leiden.

Andreas Nautsch (vitas.ai, Nürnberg, Germany)
Stephan Sigg (Aalto University, Espoo, Finland)
Isabel Trancoso (IST, University of Lisbon & INESC-ID, Lisboa, Portugal)
**Joseph Cannataci** (University of Groningen, Groningen, The Netherlands)
Aikaterina Mitrokotsa (University of St. Gallen, St. Gallen, Switzerland)

Participants

Tom Baeckstroem, Zoraida Callejas, Filipa Calvao, Alice Coucke, Uddipana Dowerah, Daniel Drewer, Jan Ellermann, Nikolaus Forgo, Nick Gaubitch, Caroline Goemans-Dorny, Catherine Jasserand, Els J. Kindt, Xabier Lareo, Anna Leschanowsky, Hiraku Morita, Shrikanth Narayanan, Le Ngu Nguyen, Gerald Penn, Maija Poikela, Aitana Radu, Bhiksha Raj, Odette Scharenborg, Björn Schuller, Cong Shi, Rita Singh, Christophe Stecoli, Francisco Teixeira, Patricia Thaine, Natalia Tomashenko, Marc Tommasi, Wiebke Toussaint, KhietP. Truong, Jacqueline Urakami, Laurens Van Der Werff, Selinde van Engelenburg, Ella PC Velner, Emmanuel Vincent, David van der Vloed, Emily Wenger, Wenyuan X. Xu, Si Zuo.

Lorentz
center

Life Sciences meets Physics with Industry 2021

8 - 12 November 2021 @Snellius
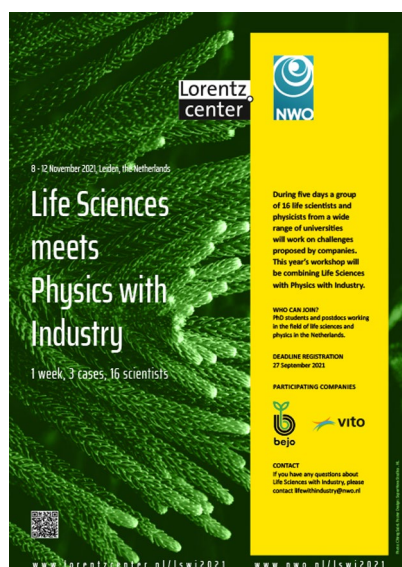
Description and aims

The workshop is intended to encourage cooperation and exchange of knowledge between academia and industry. Scientists and researchers from both academia and industry work closely together for one week to find original solutions to challenging industrial problems. From 8-12 November 2021, three teams of young scientist worked on three real-world industrial problems. The three topics were:

- Super-Pangenomes for breeding even better vegetables, from Bejo
- High-precision non-destructive 3D-volumetric measurements of small objects (0.5-2mm), from Bejo
- Personal Genome Pods, from VITO

Tangible outcome

Super-Pangenomes for breeding even better vegetables
The team identified steps to build a pangenome, created an overview of of available cutting-edge bioinformatics software tools, and proposed a strategy to incorporate pangenomic analyses into the Bejo platform for crop improvement.

High-precision non-destructive 3D-volumetric measurements of small objects (0.5-2mm)
The team set out to find a high throughput method to measure the volume of seeds. They brainstormed and researched multiple possible methods. Suggestions were made on which method to implement.

Personal Genome Pods
The team addressed various challenges that come with the creation of Personal Genome Pods; technical, academic, industrial, ethical and societal challenges. They proposed a framework to provide a platform that allows people to be owners of their data while benefiting from the latest research and analyses in the genomic field. They focused on use cases for personal, medical and R&D use.

Organization

Since 2013, the Lorentz Center has been organizing the Life Sciences with Industry workshop together with NWO. This workshop introduces young researchers to industrial research. For a whole week they work in a team on a real company issue. For each company, a representative provides feedback and support during the week. On Wednesday, there was a museum visit to the Boerhaave museum in Leiden, and a dinner at LAB071. On the last day of the workshop, the teams presented their solutions.

Joyce Burger (NWO, Netherlands)
Simone Ordelman (NWO, Netherlands)
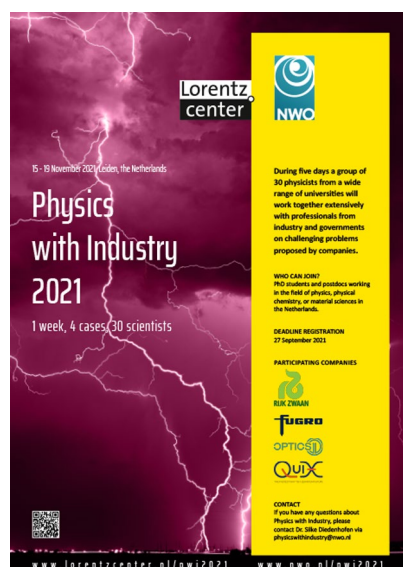**Darya Hadavi** (M4i, Maastricht university, Netherlands)
Aljoscha Wahl (TU Delft, Netherlands)
Maarten Honing (Maastricht University, Netherlands)
Stefan Brandt (NWO, Netherlands)

Physics with Industry 2021

15 - 19 November 2021 @Oort

The Physics with Industry workshop took place in the week of 15 to 19 November 2021. This was the eleventh edition of the workshop, as always organised by **NWO** and the **Lorentz Center**. Four teams worked on five real-world industrial problems for five consecutive days at the Lorentz Center. In the week before, the teams visited the companies with a full day of presentations and lab visits. Each team included four to six young researchers who are either PhD students or postdocs, an academic mentor and representatives of the participating companies. The industrial companies were a mix of SMEs, start-ups, and multinational companies.

The cases were selected by a scientific committee of five senior researchers after an open call for which companies could submit a case. For this edition, six cases were submitted of which one was retracted due to a shift of this edition from 2020 to 2021 because of the corona situation in November 2020. Another case was handled in the Life Sciences meets Physics with Industry workshop, so that the remaining four cases could be worked out during this workshop. These cases are: *High Sensitivity Universal Fiber Optic Hydrophone* from Optics11, *The High Need for an Inline Method for Measuring Water Potential in Seed Priming* from Rijk Zwaan, *Improving the Performance of Linear Transformations on a Photonic Chip* from QuiX Quantum, and *Inverted Astronomy: High Resolution Seabed Imaging from the Ocean Surface* from Fugro. 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.

On the last day of the workshop, the teams presented their solutions in front of the scientific committee. The scientific committee found that the team of the QuiX Quantum case gave a very good presentation and came up with two feasible solutions. This team will present their case at the national conference Physics@Veldhoven 2022. It is the second time that a case of Physics with Industry will be presented at this conference, and the goal of this presentation is to increase the visibility of the workshop within the Physics community.

After the evaluation of the scientific committee on the last day, a mentimeter evaluation has been done. The graphic on the right shows the positive evaluation of the participants on five different statements. Furthermore, the participants stated that their take-home messages were: "Team work and problem solving is important", "Companies do cool research, too", and "Even simple physics can be applied to solve real world problems". The positive evaluation showed that the aims of the workshop were fulfilled, namely, to increase the collaboration between science and industry, to deliver creative solutions for industrial problems, and to give insights into the wide range of possibilities that physics research offers.
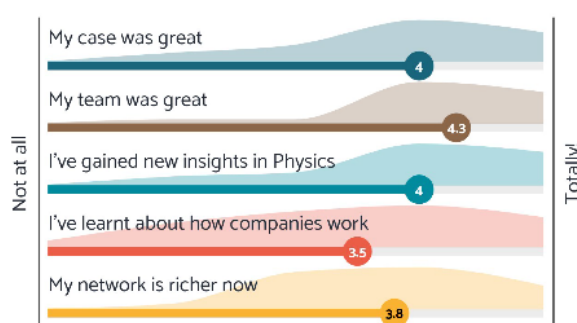
Silke Diedenhofen (Den Haag, Netherlands)
Vera Janssen (NWO, Netherlands)
René Joosten (NWO, Netherlands)
Stefan Brandt (NWO, Netherlands)
Hans Peter van der Lit (NWO, Netherlands)

Quantum Probability and Non-Commutative Harmonic Analysis

15 - 19 November 2021 @Snellius / hybrid

Description and aims

This workshop aimed at bringing together researchers from the fields of Quantum Probability (theme A), Harmonic Analysis (theme B) and Quantum Groups (theme C). Each of these three areas has developed rapidly, with a particular increase of activity during the past 5 years. Our aim is now to bring each of these individual lines together and create a fruitful cross-fertilization.

Tangible outcome

As an outcome of the workshop there are video recordings of the talks as well as a collection with slides that participants can also consult after the workshop. Many people have also initiated new collaborations. The concrete mathematical research can only be materialized on a longer term (typically a year say) in the form of preprints for instance. We are confident that the workshop has had a very positive influence on such collaborations judging from the positive comments we got from the participants.

Scientific breakthrough

Instead of pin-pointing a specific scientific breakthrough, we believe the workshop contributes strongly to a longer line of successful current and future collaborations. Indeed it has done so in the past; a good example of this is a remarkable result by Brannan (one of the main speakers) and Vergnioux in which von Neumann algebras of quantum groups are distinguished from group von Neumann algebras. This development in quantum group theory (theme C) could never have happened without the use of quantum probability (theme A). We expect that results of similar impact will appear in the coming years. We would like to note here a last talk of the conference, delivered by Mikael de la Salle, who pointed out the very first concrete connections between maximal functions, a well-studied notion from non-commutative analysis (theme B) and recent breakthroughs originating in the quantum information theory (theme A), notably the announcement of the solution of the Connes Embedding Problem. The talk gathered several ideas present throughout the meeting, showed how they feature in the CEP results, and how there is still a lot to be gained from pursuing these connections further.

Format of the workshop

At the start of the workshop we organized mini-lectures that were (relatively) broadly accessible and that gave an overview of each of the three fields of themes A,B and C. The lectures were given by experts in the field: Ivan Todorov, Guixiang Hong and Makoto Yamashita.
We have also organized 3 problem sessions as well as a number of discussions about the contents of the talks. In the problem sessions some of the main open problems and directions in each of the fields were outlined. We have asked some expert in the fields to prepare such problems, but also we have encouraged participants to actively think about these problems, do suggestions and of course present some of their own problems themselves.

The important benefit of these problem sessions is that participants from different fields become aware of such problems so that they know which directions are regarded as important in the future

development of the field. Perhaps it is also possible to tackle some of these problems using techniques from another field. Perhaps the major example of this was given in the talks/lecture series by Ivan Todorov, Magdalena Musat and Mikael de la Salle where, as mentioned above, the recently announced solution of the Connes Embedding Problem was discussed and which seems to be resolved using methods from a completely different field.

The remainder of the workshop consisted of a number of specialized talks, after which we discussed the state-of-the-art of the field.

Other comments

Due to the covid regulations the workshop took place in a hybrid format. We had around 15 participants that were physically present and about 10 -15 participants online. The hybrid setup worked out nicely and it was convenient to switch between on-site and on-line talks.

Martijn Caspers (Delft, The Netherlands)
Eric Ricard (Caen, France)
Adam Skalski (Warsaw, Poland)

Electrifying Chemistry
From Fundamentals to Industrial Applications
22 - 26 November 2021 @Oort / hybrid

Desciption, aims and breakthrough

Large-scale electrification of the industry is a crucial condition for the transition from a society based on fossil resources to a sustainable society based on renewable feedstock.

In our workshop we have discussed the main possibilities/ opportunities in electrochemistry and their issues to translate such technology into industrial scale. We focused our discussion in: (i) CO2 conversion/utilisation, (ii) organic chemistry and (iii) biomass conversion. Among those topics we discussed issues related to electrode material, process intensification and scale up technologies.

We reviewed the electrochemical reactions from atomic and industrial scale perspectives, from fundamentals of electron transfer to commercial applications. We focused on developing a multidisciplinary perspective, which is crucial to bridge the gap between industrial and academic research.

The high level of our speakers and the valuable interaction between speakers and participants, either onsite or online turned this workshop into a remarkably vibrant scientific event. Due COVID-19, for many of the onsite participants, this was the first in-person meeting, thus the energy in the room was fantastic. All onsite participants were willing to transfer this energy feeling to the online attendants. As organizer, we were glad and surprised to see how the online participants interacted in a very active way during the whole week, independent on the time zone.

The most challenges and advances in electrochemical transformations were discussed from different perspectives and are briefly summarized in the following paragraphs.

The progress and possibilities of electro-organic synthesis were presented by S. Lin, T. Noel, S. Waldvogel, R. Brown, D. Cantillo, R. Francke, S. Beil and C. Willans. They discussed at atomistic level the presence of radicals, and the advances in flow chemistry in a small bench scale. To complement their discussion, N. Aust from BASF gave a brilliant talk where all the atomistic condition presented before was translated into scale up technologies.

T. Sargent, M. Escudero, M. Figueiredo, C. Andronescu, M. Koper and B. Roldan gave an overview on the effect of electrode material, structure, stability of catalysts and electrolyte composition on the electrochemical conversion/utilisation of CO2. They presented the advances in spectroscopic techniques to help in the interpretation of mechanistic aspects of this reaction towards valuable products. To complement their talks, E. Gallent and P. Shirvanian, and N. Yan, gave an overview on the scale up opportunities for the CO2 utilisation and green H2 production.

Opportunities on biomass conversion to value-added products were also discussed during the workshop. E. Biddinger discussed the influence of reactor design during the electrochemical reduction of furanics, while P. Fernandez and A. Garcia discussed the use of in situ spectroscopic techniques during biomass conversion and the opportunities and challenges to scale up such reactions.

Intense debates during the Q&A session led to a new perspective on the possibilities of electrochemistry for industrial application. Based on the discussion and interest in research areas, we separated participants in three different groups:

- CO2 valorisation
- Biomass
- Electro-organic synthesis

The idea was to stimulate group activities among the participants, as a result of such activity and a follow-up of the workshop, we all will write a Perspective article involving the three topics. We will discuss possible cases, limitation, and opportunities. A. Garcia, E. Gallent and T. Noel will lead Biomass, CO2 valorisation and electro-organic synthesis groups, respectively.

Tangible Outcome

Despite our workshop has finished, our activities are still going on. Each leader will contact the participants from their theme, and they will transfer the information to A. Garcia, who is in charge to organize the manuscript. Online meetings will be organized every three months between the different topics. Our deadline is to have a first draft of our manuscript by the end of 2022.

Format of the workshop

Our workshop lasted 5 days. We had 23 on-site and 19 online participants. The format of the workshop was distinct from the regular conferences. First, we had a hybrid mode, to give chance to people from abroad to join us, because of Covid-19, this was a valuable strategy. We also made more available time for interaction among the participants, so they could change ideas, experiences and establish connection for further internships and / or joint proposals.

The central part of our workshop was devoted to the group activity (Perspective article). During the sessions, which took place every day, in the morning and in the afternoon, 1-1,5 hour each, there was a coordinator with more experience, and two co-coordinators, younger, who were asked to take notes, to help with the literature source and to summarize the discussion during the closing sessions. We gave special attention to the online participants, so they could keep motivated during the whole session.

Other comments

As a conclusion, as organizers, we are pretty sure our workshop was a big success. We received a lot of positive feedbacks from all participants. We believe our success is due to the worldwide importance of our topic, the high level of speakers and the fantastic infra-structure and support we received from Lorentz Center.

Amanda Cristina Garcia (University of Amsterdam)
Timothy Noel (University of Amsterdam)
Elena Pérez-Gallet (TNO - Delft)
Siegfried R. Waldvogel (Johannes Gutenberg University Mainz)
Ning Yan (University of Amsterdam)

Green Conservation Materials for European Heritage

22 - 26 November 2021 @online

Aims for the virtual meeting

The main objective of the Workshop was to gather key experts of from the various areas of cultural heritage science and conservation in Europe to define priorities and urgencies that are essential to pursue a greener and more sustainable future in this field. This Workshop helped lay out a roadmap for the definition of the key measures needed to achieve a greener conservation for the European heritage, with a focus on the role of Chemistry and Chemical Engineering in Cultural Heritage Science and on the need of creating an open dialogue between the characterization stage and the technological implementation of the conservation strategy.

Key moments (key debates, breakthroughs, etc.)

Designing greener approaches for the preservation of Cultural Heritage artifacts unanimously represents today a crucial challenge. Intrinsically connected to the most defining issue of our time, this topic urges the attention of the chemistry community, as well as the broader scientific one, if we want to find effective solutions through less hazardous chemical processing, lower energy consumption and product wastes. Each day of the Workshop was dedicated to a specific thematic. The keynotes presented by the participants raised important questions and fed discussions of high impact, not only from a scientific but also from a social point of view. The thematic discussion faced important topics like the need of a unanimous definition of green across the different applicative fields, the importance of having an impact at industrial but also educational level, or the role of institution in guiding the transition towards more sustainable practices. Key debates have touched upon the most recent practices using natural products employed in conservation, the sustainable practices to leverage cultural heritage to make effectively industry wide impact, and how to design preventive conservation approaches and new chemical procedures for green restoration, cleaning and protection of cultural heritage materials. The role of chemistry in providing effective protective strategies against environmental conditions, and particularly in estimating the molecular response of objects to change in environmental conditions, has been highlighted too. The possibility to apply computational modelling to this aim was paralleled with the methods actually applied in museums for environmental control, and to ensure a preventive conservation of the collections. Several discussions focused on the measures adopted to improve the energetic sustainability and waste management in cultural institution (i.e., museum, archaeological site, etc.) and on the need to develop new, adapted, characterization methods (particularly in imaging, coupling high-end and portable instrumentation) to assess green conservation treatments and material evolution in museums and sites. The key role of culture (heritage) to a more sustainable future was a key element in the panel discussions. The group discussed the need to integrate green conservation in educational programs to increase the awareness of the future generations of practitioners in the field. The teaching perspective have been central, together with the need to communicate the importance of green conservation to broader audiences. A virtual visit to the Material Culture Studies department of the University of Leiden led by Professor Annelou van Gijn highlighted the importance of cultural heritage in raising the awareness of common public towards a more sustainable way of preservation.

Outcome(s)

The final outcome of this Workshop has been the preparation of a practical roadmap for continuing the green movement in Heritage Conservation, to be finalised and distributed as a main outcome of the Workshop. The Workshop has been at the forefront of coordinating international efforts towards building a coherent system that supports sustainable solutions. At the end of the 5-days, the

participants prepared a draft document called "The Green Heritage Conservation Manifesto", structuring the most urgent actions to be taken around ten core points. These ten points aim at establishing the main steps to contribute to the Green Deal in care, display, storage and treatment of cultural heritage (see attached). The Manifesto is a formal commitment from the conservation science community to reach the objective of the Green Deal. The Workshop developed in a warm; studious and creative atmosphere, and has been a starting point for long term collaborations between the participants, all seeking to apply knowledge and research to facilitate the transition into a low-impact and sustainable future in this field.

Other comments

Conservation chemistry has reached a point where it bridges different disciplines such as material science and engineering, statistics and computer science: the conservation chemistry community has thus now the opportunity to transform and adapt its current practices and conduct them into a greener path through an enhanced, permanent, dialogue among the main actors and stakeholders working on the field.

Institutions acting alone will not achieve the environmental ambition of this purpose. The expertise and the financial resources must be globally mobilized (and not limited by national borders) to build alliances and partnerships with the likeminded.

The extent of the matter is calling for a number of diverse experts to meet and actively discuss the potential of their complementarity for the successful improvement of novel solutions in this domain.

Preparation

We opted for synchronous contents, consisting in 20 minutes for individual presentations held by each participant followed by 1 hour topical group discussions on the thematic of each day.
On day 5 we organized half day of group discussion, aimed at finalizing the draft document of the Manifest and defining the short and long term objectives of the workshop.

Duration of the workshop and time management

5 days of 3 hours (2 pm – 5 pm Mon-Thr, 10 am – 12.30 pm Fri)

Short- and long-term plans for follow-up

Short term

- Exchange with the participants to finalize the ten points of the Manifesto.
- Program periodic discussion with the other workshop participants, seeking EU funds to secure collaboration
- Review of the Manifesto by experts external to the Workshop.

Long term

- Prepare a web platform of the Green Heritage Conservation Manifesto.
- Prepare a video of the ten points from the Manifesto.
- Diffuse the Manifesto through social media channels of organising institutions.
- Prepare a communication planning.
- Open an endorsement signatures platform to broader public and institutions.
- Dissemination to Conferences (InArt, GRC conference "Scientific Methods in Culturel Heritage Research", ChemCH, YOCOCU)
- Preparing the proposal of a review (or position paper)

Lessons learned for future virtual events

During virtual workshops, it is important to have interactive sessions between the participants.

Other comments

We would like to thank the staff of the Lorentz Centre for their very effective and efficient support to the event, especially when it had to be rescheduled virtually due to late changes in the Covid pandemic situation in the Netherlands.

Alessia Artesani (Center for Cultural Heritage Technology, Italian Institute of Technology, Venice, Italy)
Loïc Bertrand (École Normale Supérieure de Paris-Saclay and Université Paris-Saclay, Paris, France)
Giulia Franceschin (Center for Cultural Heritage Technology, Italian Institute of Technology, Venice, Italy)
Katrien Keune (Conservation & Science Department, Rijksmuseum & Van 't Hoff Institute for Molecular Sciences, University of Amsterdam, Amsterdam, The Netherlands)
Arianna Traviglia (Center for Cultural Heritage Technology, Italian Institute of Technology, Venice, Italy)

The Volatile Content of Planets that Form Early

29 November - 3 December 2021 @online

Description and aims

In this workshop we investigated the "branching points" in planetary evolution that result in terrestrial planets with different amounts of life-essential elements: C, H, O, N, and S. These elements impact the formation and evolution of habitable planets at all stages of their history. We discussed these branching points from both directions: from the top down with disk observations and planet formation theory, and from the bottom up via the outcome of planet formation represented by Earth's own history and the diversity of exoplanets. Our participants were experts on this topic from observers and theoreticians of the Solar System, protoplanetary disk, and exoplanet communities.

Key moments

On Tuesday during the discussion there was no agreement about what the structure of young disks was. Therefore planets that form early likely have a totally different compositional template than planets that form late. A second key point was on Thursday, when we heard from our geologist experts regarding whether volatile elements survive in terrestrial planet interiors, which is particularly dependent on their early thermal history. Short lived radioisotopes such as 26Al contribute significantly to this early thermal history, meaning only early formed planets directly experience such heating, confirming again the importance of knowing when and where in protoplanetary disks planets form.

Outcomes

The outcomes of the workshop are that a) participants have established future collaborations between each other, b) we identified key opportunities posed by future observations to resolve questions in CHNOPS delivery and distribution in planetary systems. Finally, we have assembled and distributed a list of all the branching points proposed during the workshop, along with potential observing opportunities. We are planning to coordinate observing proposals for upcoming telescope proposal rounds.

Organization

The workshop was entirely online due to corona, over Zoom and Slack. The daily schedule consisted of 3-4 pre-recorded talks, which could be viewed asynchronously offline or synchronously from 13:00-14:45. A month in advance the organizers emailed the speakers of each day with a theme and goals for their talks, to coordinate them. We encouraged the participants to put their questions into the Slack channel for that day's talk. The main synchronous session started at 15:00 with a 15 minute

plenary recap of the previous day's discussion. Then there was a 15 minute panel discussion of the talks and how they relate to the daily theme, with that day's speakers, including time for addressing some of the questions posed in Slack. Then there was an additional 15 minute plenary discussion between a moderator and the participants to discuss what topics for discussion there should be in the breakout rooms. For the first two days, the organizers pre-made topics for select branching points to discuss in six breakout teams. We also pre-assigned the participants to teams. Then there was either a 1 hour session to discuss that day's topics in breakout rooms, with pre-planned open-ended questions to drive the discussion, or two 30 minute sessions on narrower, dynamically determined topics to allow to flexible discussion and participation in multiple topics. Finally, there was a half hour plenary session for the breakout team leaders to report out to the whole group. After the end of the day, the organizers spent another 30 minutes reviewing what we had done and curating the list of outcomes for the next day. After the conference, we put together the final meta-list of branching points to send around later that week. We will be in touch with the group over Slack in the spring to start up some observational proposals.

Our main lesson is that reviewing the progress after each day and having pre-planned topics and icebreaker questions is critical to getting people to participate online. It was also helpful to have the organizers in each team to give the break out rooms some structure. It seemed like the dynamically generated breakout topics were well received but also had the potential to end in less concrete end-of-day results. It was also important to have a good mix of expertise in each breakout team's participants, and to invite at least some participants who were naturally more talkative to keep conversations going.

Lorentz Center (virtual) Support

Definitely using Slack/Zoom was good, because it gave us more flexibility in changing everything at the last minute without needing to iterate with the LC directly (since we were familiar with Slack and not Teams). We otherwise thought that the support was excellent.

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Hack the Hackathon

Shaping the future of hackathon research and practice

6 - 10 December 2021 @online

Aims for the virtual meeting

With the workshop, we provided an opportunity for researchers and practitioners from different communities to exchange knowledge, discuss challenges, and ultimately form a larger, cohesive community around hackathons. The workshop was organized around three broad themesduring the first three days, which covered best practices, training and support materials for organizers and future challenges. The fourth day was dedicated towards producing tangible outcomes which were shared on the fifth and final day.

Outcomes

Our key goals for the workshop were to (1) create a community around hackathons and (2) produce (or start lasting initiatives to produce) tangible outcomes. During the workshop, we heard from many participants that an effort around bringing together practitioners and researchers had been missing and that the workshop generated connections across different disciplines and institutions that are unlikely to have happened without this workshop. As hoped, the discussions during the workshop brought a number of issues and questions to the forefront. Several were tackled directly at the workshop, while others are now being addressed by a number of initiatives that were started at the workshop and that are now being continued. Highlights include the realization that a better definition and understanding of the term

"hackathon" is needed to guide both organizers and researchers. This definition was started at the workshop and there are plans to finish and publicize it (for example via a planned whitepaper, and through subsequent wikipedia edits). Other outcomes include an initiative to build a joint "Hackapedia" - a database collecting information and supporting materials around hackathons -, a push towards international certification of organizers (Certified Hackathon International Professional; CHIP; https://hackhpc.github.io/CertifiedHackathonInternationalProfessional/), the beginnings of a guide for online and hybrid events, and a definition of how to make hackathons safe and welcoming spaces. Many of these topics were too complex to be fully addressed during the workshop itself. However, as hoped, the workshop provided the venue for these ideas to incubate, and to form groups of like-minded researchers and practitioners to continue working on these topics. In addition to the above, we'd like to highlight plans to bring together an organizing team for a follow-up workshop, a group of participants starting to incubate and facilitate collaborations between researchers and practitioners on research projects, plans to run a regular seminar series around hackathons, and plans to seek funding. As organizers, we are currently in the process of making sure these initiatives are properly started up.

Other Comments

Generally, the post-workshop survey (19 respondents out of ~30 participants) indicates that the vast majority of participants found the various sessions at the workshop useful and enjoyable (between 15 and 17 of 19 responses depending on the session). Multiple participants mentioned though that they would have preferred an in-person meeting because it would have helped them to avoid competing responsibilities e.g. at their home institution. Moreover they also thought that it would have allowed for more unstructured interactions.

Participants also positively remarked on the usefulness of the allowance for online participants. The allowance we provided according to the post survey was mainly used for meal delivery, daycare and as a stipend.

Preparation

To prepare for the workshop we developed a schedule around a 3 hour time span that we spent as joint sessions between two larger time zone groups and that served as the beginning of each day. These two groups were based on the time zones GMT+0 to GMT+2 (named by the participants during the workshop "Team Platypus") and GMT-8 to GMT-3 ("Team Tiger"). The rationale behind this schedule was to collectively define questions to be answered or problems to be addressed during a joint session with all participants. This formed the basis for separate discussions of breakout group participants in Team Tiger (on the same day) and in Team Platypus (next morning CET). From the second day, the joint session in the afternoon would then also include another opportunity for the different subgroups in each break-out group to synchronize and share their results. Because this schedule was somewhat confusing, we provided calendar invitations via .ics files for all the sessions to the participants. We also compiled and provided a large central overview document with all information and relevant links. Nevertheless, the sheer amount of tools, platforms and links proved to be somewhat challenging throughout the week, both for organizers and participants.

Keynotes and short talks were given synchronously via Zoom, mostly during the early to mid-afternoon CET, with a scheduled opportunity for participants in the very early morning time zones of Team Tiger to rewatch a recording together later that same day. On the practical side, our organization was supported by a main storyboard which included key information including timing of sessions, details of activities, facilitation notes, instructions for tech support and information about responsibilities of the different organizers running each session. In general, we aimed to have two organizers on call for joint sessions: one who facilitated, and one who performed support activities (share links, manage Discord communication, generate Zoom break-out groups). We also conducted an organizer debrief session at the end of the joint session to discuss potential issues that arose during the day and prepare for the following day. In addition, the logistical and technical support from the Lorentz Center Coordinator proved to be invaluable throughout the week.

Duration of the workshop and time management

The workshop lasted for 5 days. Each day started with a 3 hour joint session between both timezone groups and 3 hour sessions within each time zone. Joint sessions were conducted by all four organizers. Common sessions were run by organizers located in time zones corresponding to the two teams.

Platform(s) used before and during the workshop

To prepare for the workshop we mainly used Zoom between the organizers and MS Teams to communicate with the Lorentz center. We also created a common GoogleDrive folder in which we stored several preparation documents such as the aforementioned storyboard.

During the workshop we used Zoom for synchronous sessions. These included keynotes, short talks, share-outs as well as breakout groups such as ice-breakers. In addition we used Discord for asynchronous communication during the workshop and for break-out groups and the hackday. Participants used both Zoom and Discord for break-out groups because few participants had technical issues with voice calls on Discord. During the workshop we also used a common GoogleDrive folder to record conversations during joint sessions and as workspaces for break-out groups. Finally we used the wonder.me space provided by the Lorentz center for coffee breaks.

Lessons learned for future virtual events

One weak point of the workshop proved to be the coffee breaks: there was little uptake of the opportunities in wonder.me for chatting outside of structured activities. At the same time, our end-of-workshop survey suggests that participants would have liked more opportunities for one-on-one and unstructured interaction. As organizers, we concluded that in future workshops, we will clearly designate "offline breaks" (where participants are expected to be offline and take a break from the screen) and "interaction breaks", where we provide venues for unstructured interactions.

In general, the schedule - while significantly pared down from an in-person workshop - proved still too dense and long for a virtual meeting. In the future, we will make additional strategic decisions about which parts of the workshop are strictly required, and which can be shortened or removed. The lack of a single platform that can fulfill most of the needs of a virtual workshop (synchronous talks, asynchronous text communication, self-organized break-out groups, unstructured interaction during coffee breaks and shared documents) continues to complicate workshop organization. In our case, there was occasional confusion about where participants were supposed to interact (Zoom, Discord, wonder.me) in any given session. In the future, we will make sure to be explicit about this. Finally, while we were delighted with the overall attendance of the virtual workshop (~30 during joint sessions from 50 registrations), a larger group of participants would probably have been helpful, both in terms of adding valuable perspectives, and in terms of generating enthusiasm and excitement. During break-out sessions groups split into different time zones which were generally quite small. We hope that future workshops might have a wider reach, allowing for a larger group of participants to come together.

Other comments

As organizers we found it particularly challenging to switch from an originally planned hybrid meeting to a fully online workshop on a short-notice.

Comments/points for improvement for the Lorentz Center team

We do not see many ways in which the support by the Lorentz center team can be improved. We were pleased with the responsiveness and flexibility when the COVID situation in the Netherlands necessitated a transition from a hybrid to a virtual event on a short notice. We also recognize that our funding situation was more complex than perhaps usual, and we are grateful to the event coordinator's invaluable support in successfully navigating the requirements of both funding agency and university.

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Lorentz
center

The Turks are Coming!
The Popular Outreach of Turkish TV Series
6 - 10 December 2021 @Snellius / hybrid

Description and Aims

This workshop aimed to investigate the socio-political impact and international outreach of Turkish television series. Its main goal was to explore new ways of how research on Turkish TV series can be further developed and facilitated. For this purpose, the organizers brought together an international and interdisciplinary team of researchers and TV producers. Together, the participants sought to obtain a better understanding of the field, investigate the use of computational science methods for their research, and lay the foundations for sustainable research cooperation in the future.

Tangible Outcome

Six keynote speeches presented valuable state-of-the-art research on Turkish television series and provided an insight into the opportunities of using computational sciences methods for studying large chunks of visual data. The presentations and subsequent panel discussions also pointed out the role of TV series in the formation of authoritarian populism in Turkey, in particular with regard to the creation of state propaganda and the (re)invention of national history. In two separate workshops, the participants further explored the options of using digital research tools to Turkish television drama by sharing experiences and methods and demonstrating a model for visual analysis. This triggered a fundamental discussion on the usefulness of computational science methods in the field. The connection to the production side, which is essential for doing research on Turkish television drama, opened up a fruitful discussion on how to establish contact and get access to the field.

Creating a research network turned out to be key to further developing the field. It will provide opportunities to benefit from each other's know-how, methods, expertise, and contacts. To establish the network, a to-do list with different tasks has been distributed among the participants. The workshop indicated three main activities to elaborate on; collaboration in conferences, applying for funding programs, and joint publications. Concrete plans for collaboration in joint panels and publications were made, and funding possibilities were explored in a workshop and further developed in the discussion. The network will apply for a COST European Cooperation in Science and Technology and organize several conference panels in 2022.

"Aha" moments

A network does not function without a name, website, e-mail list and an internal communication tool. The decision process on the network's name is underway, a Discord server is established, a website and e-mail list are in the making.

National and international audience research on the socio-political impact of Turkish TV series is still an underrepresented field and needs to be further developed if we want to gain a better understanding of the socio-political relevance of Turkish TV series.

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Design

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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'