Dutch Research School of Theoretical Physics

ANNUAL REPORT 2013

Landelijke Onderzoekschool voor Theoretische Natuurkunde
Dutch Research School of Theoretical Physics (DRSTP)
Landelijke Onderzoekschool voor Theoretische Natuurkunde (LOTN)

Visiting address:
Minnaert Building
Leuvenlaan 4
3584 CE Utrecht

Postal address:
P.O. Box 80.195
3508 TD Utrecht
the Netherlands

telephone: +31 (0)30 253 5916
e-mail: science.secr.drstp@uu.nl
website: http://web.science.uu.nl/drstp/
Preface

This DRSTP Annual Report 2013 provides an overview of the educational and research activities during 2013. The Annual Report also presents two research highlights written by staff members of the Research School. In addition, it offers information, such as a list of the participating staff, of the PhD students, a comprehensive list of publications, as well as other relevant statistics.

The Annual Report is not the only information that is provided by the DRSTP. A monthly Newsletter is published as well as a yearly Educational Guide containing all DRSTP activities. Up-to-date information is readily available on our website at: http://web.science.uu.nl/drstp/

We would like to thank all of those who contributed to the Research School during this past year.

Prof. G.E. Arutyunov Prof. E.P. Verlinde
Scientific Director Chair Governing Board

November 2014
## Contents

1 | General information ................................................................................. 6
2 | The DRSTP in 2013 .................................................................................... 8
3 | Scientific highlights ................................................................................ 19
4 | PhD program ............................................................................................ 24
5 | Scientific staff (per 31-12-2013) ............................................................ 83
6 | Academic publications ........................................................................... 89
7 | Scientific activities ............................................................................... 110
8 | Scientific-related activities .................................................................... 136
9 | Research funding .................................................................................. 144
10 | Organization (per 31-12-2013) ........................................................... 151
11 | Partners and associate members ..................................................... 153
   Appendix A | Mission statement .............................................................. 157
   Appendix B | Selection and supervision procedure of PhD’s .......... 161
   Appendix C | Postgraduate courses (AIO/OIO schools) ..................... 163
   Appendix D | Symposium Trends in Theory............................................... 167
   Appendix E | PhD Day ............................................................................... 175
   Appendix F | National seminars .............................................................. 179
   Appendix G | Statistics .............................................................................. 181
1 | General information

The Netherlands has a long tradition in theoretical physics which involves research performed at university institutes, industrial laboratories, and government institutions. The strength of this research area is, for a large part, based on the unity of methods employed in a wide range of applications. This manifests itself both in scientific research and in academic education.

To structure and coordinate the graduate education in theoretical physics, the Dutch Research School of Theoretical Physics (DRSTP) was formed. The school is a cooperation between the theoretical physics groups of six Dutch universities: University of Amsterdam (UvA), Vrije Universiteit Amsterdam (VUA), University of Groningen (RUG), Leiden University (UL), Radboud University Nijmegen (RU), Utrecht University (UU) (commissioner) and of the National Institute for Subatomic Physics (Nikhef). In addition, there are several associate members. The DRSTP was accredited in 1994 by the Royal Netherlands Academy of Arts and Sciences (KNAW) and reaccredited in 1999, 2004 and 2010.

The main objectives of the DRSTP are to implement a joint program of graduate education in theoretical physics and to maintain and strengthen research in theoretical physics from a broad unifying perspective that exploits the interrelationships between different fields of theory. The DRSTP is based on the conviction that a joint venture of all the moderately sized local theory groups, each with its own profile, offers added value for the achievement of these objectives.

Theoretical physics is based on universal principles. New concepts often have a much wider validity than in the field in which they are discovered, and methods developed in one field are sometimes very useful in another. Hence, theoretical physics is characterized by unity in diversity. The research program of the DRSTP is organized according to two themes:

- Theme 1: Particle physics, cosmology, quantum gravity and string theory.
- Theme 2: Quantum matter, quantum information, soft condensed matter and biophysics.
The specific content of the research program depends on the responsible project leaders, on their creativity as well as their success in acquiring research funding from their home university, from the Dutch research councils of NWO, or from international sources such as European Union programs.

The research output of DRSTP members presented in this Annual Report is presented according to the two mentioned research themes. The mission statement of the DRSTP can be found in Appendix A.
On 31 December 2013, there were 66 tenured, 61 non-tenured staff members (postdocs) and 112 PhD students affiliated to the DRSTP. The research output led to 29 PhD dissertations and 299 academic publications.

*Mutations in the organization of the DRSTP*
* Dr. W.J.P. Beenakker (RU) succeeded Prof. R.P. Klein (RU) as member of the Educational Board.
* The following PhD Student Council members were elected in 2013: M.A. Janssen MSc (UU), N. Pinzani Fokeeva MSc (UvA), L.P. Pires MSc (RU), S.K. Saravanan MSc (UL) and A. Signori MSc (VUA).

In Chapter 10 an overview is provided of the DRSTP committee members per 31 December 2013.

*Mutations of members of partner institutes (new appointments, resignations, termination of DRSTP membership, retirement, inaugural lectures)*

**New appointments:**
* UvA: Dr. A. Castro Anich, Assistant Professor, per 1 September 2013; Dr. V. Gritsev, Associate Professor, per 1 October 2013; Dr. D.M. Hofman, Assistant Professor, per 1 September 2013.
* RU: Dr. F. Saueressig, Assistant Professor, per 1 April 2013.
* UU: Dr. L. Fritz, Assistant Professor, per 1 November 2013; Dr. D. Schuricht, Assistant Professor, per 1 October 2013

**Resignations:**
* UvA: Prof. C.J.M. Schoutens resigned as Dean of the Faculty of Science per 1 January 2013; Dr. A.M. Turner resigned from the Institute of Physics on 30 July 2013 and took up a position as a tenure track Professor at the Johns Hopkins University, Baltimore, USA.

**Termination of DRSTP membership:**
* RU: Dr. T.A. Rijken (emer. 2007).

*Honorary doctorates, (poster) prizes/awards, NWO grants, fellowships, distinctions of members of the DRSTP*
* A. Bagrov MSc (UL) received a research grant from the Russian Foundation for Basic Research, 12-01-398 (together with Dr. Dmitri Bykov, Max Planck Institute for Gravitational Physics, Potsdam, Germany).
* Prof. F.A. Bais (UvA) received the Freya Award (Comenius), for contributions to setting up courses and lecturing for managers and executives.
* Dr. R.A. Duine (UU) became a member of the Advisory Editorial Board of Journal of Physics: Condensed Matter.
* Dr. S. Gryb (UU) was awarded an NWO Veni Fellowship for his research entitled: *On the origin of time and scale.*
* Dr. U. Gürsoy (UU) received an NWO Vidi grant for his proposal entitled: *Wisdom of black holes.*
* Prof. M.I. Katsnelson (RU) received an ERC Advanced Grant 2013 for his research entitled: *New physics theory for nanoscale and hyper speed.*
* Prof. Katsnelson (RU) received the Spinoza Prize 2013 for his research in solid state physics, in particular graphene.
* Prof. Katsnelson (RU) was appointed a member of the Academia Europaea.
* Prof. F.C. MacKintosh (VUA) became a member of the Board of Directors at FOM per January 2013.
* Prof. R. Loll (RU) was awarded FOM Vrij Programma Award for the Proposal "Quantum Gravity and the Search for Quantum Spacetime” at IMAPP.
* Prof. R. Loll (RU) became Invited Member of the Academia Europaea, a European nongovernmental Academy of Humanities, Letters and Science.
* Prof. R. Loll (RU) was appointed Distinguished Visiting Research Chair at the Perimeter Institute for Theoretical Physics, Waterloo, Canada (since 2009).
* Dr. S.V. Murthy (Nikhef) received an NWO Vidi grant for his proposal entitled: *What are black holes made up of?*
* Dr. Th. Nieuwenhuizen (UvA) had an Exchange Professorship at the Center for Cosmology and Particle Physics (CCPP) at the New York University from 7-28 January 2013.
* R.J. Rietkerk MSc (UvA) received the Poster Prize (Best Poster 2013) UvA at the IoP Symposium on 23 May 2013.
* Dr. D. Roest (RUG) was appointed a member of the KNAW Young Academy per October 2013.
* Dr. K.E. Schalm (UL) received an NWO Vici Award on 31 January 2013 for his research entitled: *Applied string theory: explaining quantum matter with black holes* on 31 January 2013.
* A. Sfondrini MSc (UU) was awarded the Vito Volterra prize for young researchers by the Italian Physical Society (SIF) during the opening ceremony of the annual SIF Conference in Trieste on September 23rd 2013. The prize is awarded yearly in memory of the mathematician and physicist Vito Volterra (1860-1940), who was among the founders of the Italian Physical Society. Alessandro, who is a doctoral candidate at the Institute for Theoretical Physics in Utrecht, has received the prize for his research activity in Theoretical and Mathematical Physics, and in particular for his work on integrable structures in the AdS/CFT correspondence under the supervision of Prof. G.E. Arutyunov.
* G. Soligno MSc (UU) received the 1st Poster Prize award entitled: *Free energy of colloidal particles at a fluid-fluid interface,* during the 7th Department Day, Utrecht University, in May.
* Dr. M. Titov (RU) received a FOM grant for his research entitled: From topological insulators to topological magnets.
* W. van der Schee MSc (UU) was awarded a Visiting Graduate Fellowship from the Perimeter Institute as well as a Prins Bernhard Cultuurfonds grant for the same visit in November 2013.
* Prof. R.H.H.G. van Roij (UU), was appointed to the new Soft-Matter Theory Chair as Professor per 1 January 2013.
* Prof. E.P. Verlinde (UvA) was elected as new member of the Royal Holland Society of Sciences and Humanities [Koninklijke Hollandsche Maatschappij der Wetenschappen] (KHMW) on 25 May 2013.
* Dr. E.I. Zavala Carrasco (RUG) obtained a qualification as "Maître de Conférences" on 1 February 2013 from the Ministère de l'Enseignement Supérieur et de la Recherche, France, Section 29, Constituants élémentaires.

**Guest chairs**

Each year eminent theoretical physicists hold guest chairs at our affiliated institutes.

* Professor H. Eugene Stanley (Center for Polymer Studies, Department of Physics, Boston University, USA) occupied the Lorentz Chair at Leiden University from 1 May to 30 June 2013. Professor Stanley taught a three lectures course entitled: Novel statistical physics approaches to complex systems on 3, 8 and 29 May 2013:
  - Statistical physics approaches to complex liquids - liquid water, the most complex liquid, 3 May 2013;
  - Statistical physics approaches to complex networks - the fragility of interdependency: when networks are coupled, 8 May 2013;
  - Statistical physics approaches to economic fluctuations - switching phenomena without switches: what can we do before the next economic crisis?, 29 May 2013;
  - Novel statistical physics approaches to complex systems, Ehrenfest Colloquium, 15 May 2013;

**Visiting professorships held by DRSTP staff**

*Dr. G.J. Stephens, Associate Professor (VUA), Okinawa Institute of Science and Technology, Japan.

**Visiting scientists (long term)**

* Professor J.C. de Gier (Melbourne University), KNAW Professor, visited the Institute for Theoretical Physics, University of Amsterdam, from 1 June-10 July and 5-15 December 2013.
* Dr. Stefano Frixione (CERN) visited Nikhef, Amsterdam, from October-November 2013.
* Dr. Lorenzo Magnea (University of Turin) visited Nikhef, Amsterdam, from May-June 2013.
* Prof. N. Manojlovic (University of the Algarve, Faro, Portugal), visited Radboud University Nijmegen from 2 October-30 November 2013.
Delta Institute for Theoretical Physics (D-ITP)
The D-ITP Kick-off took place on the 31st October 2013 at Westerliefde, Amsterdam.

The Delta Institute for Theoretical Physics unites the existing institutes for theoretical physics of the University of Amsterdam, Leiden University, and Utrecht University.

The consortium obtained an enormous boost in 2013 with the award of a new grant worth 18.3 million euros from the Netherlands Organisation for Scientific Research (NWO) as part of its 'Gravitation Program'. The associated scientists are determined to continue their tradition of scientific excellence by attacking the grand challenges of modern physics and by attracting a new generation of top talent.

The research program of the Delta Institute for Theoretical Physics is driven by the conviction that theoretical physics can play a unifying role in the exploration of matter at all scales, because the same mathematical concepts and techniques can apply to vastly different physical situations. The history of physics shows that breakthroughs in our understanding quite often result from a description that unifies what was previously disjoint. This motivates us to join forces and attack problems that have resisted solution for decades.

Besides working in conjunction with the DRSTP towards getting theoretical physics back to the top of the international agenda, the D-ITP has also won the support of a number of prestigious private partners. Their support highlights the importance of theoretical physics not only with regard to their own enterprises, but also with regard to society in general. Working together with these partners, the D-ITP will be able to bring undergraduates and graduates alike into closer contact with industry and permanently strengthen the relationship between theoretical physics and society.

More information is available at the D-ITP website: http://www.d-.itp.nl/.
“Just before the end of the year Professor Pierre van Baal passed away unexpectedly. With him we have lost a unique figure with great passion for research and teaching. In 1980 he came to Gerard ‘t Hooft as an aspiring PhD student with two diplomas, one in Mathematics and one in Physics. This combination has always played a role in his scientific activity.

His PhD research was on the topic of the strong force, Quantum Chromodynamics (QCD). Quarks are the building blocks of atomic nuclei and they exist in three versions with different "colours".

They also carry another quantum number, “flavour”, of which six varieties have been found experimentally. They are held together by gluons, that also carry colour. At short distances, much smaller than a femtometer, these couple very weakly to quarks. At greater distances the coupling increases and it causes the confinement of quarks and gluons. The mathematical explanation of this phenomenon would become the focus of Pierre's research.

Pierre had the task to put such a system of weakly coupled quarks and gluons in a small “femto-box” to analyze it. This was a benchmark for computer simulations on the lattice. But the simulations could also explore the regime where the interactions become strong.

Numerical simulations became widely used just in this period and from 1984, when he took a postdoctoral position at the University of Stony Brook, Pierre was asked to speak at many yearly conferences of lattice practitioners. Later in the 80's his mathematical skill resulted in research articles with, among others, Raymond Stora on Witten's topological Yang-Mills theories.

In 1992 he held his inaugural lecture as Professor at the Lorentz Institute with the title “A strong story (a tall tale) of colours and flavours”. In those years he stimulated the numerical approach to “Quantum chromodynamics”. He was the nucleus of a group of PhD students and postdocs that played an influential role in unraveling the mysterious properties of QCD.
In 1998 he discovered a new excitation, the "caloron". As the name suggests, this excitation plays a role at high temperature. The novelty of Pierre's caloron was that not only did it share the properties of another excitation already known for two decades, the "instanton", but it also was a composite of colour-monopoles that was on the whole colour-magnetically neutral. In the last five years this idea has seen an intense revival of activity. It was also in this period that he joined the project HiSPARC, by which secondary school students are taught how to build their own cosmic ray detector.

In 2005 he had a misfortune in the form of a stroke. With much energy he learnt to minimize the physical consequences. His mother and his family contributed strongly to that. In the following years he went back to teaching and his quantum field theory lectures are now published as a textbook. But he was not able to do research again. Half a year ago his closest collaborators came together in a symposium to celebrate Pierre's inspiring research achievements. A published volume with a selection of his articles crowned the occasion. Just in time to see him really happy once again.

Author: Chris P. Korthals Altes
Nicolaas Godfried van Kampen was born on June 22, 1921 at Leyden, the Netherlands, where his father held a chair in zoology at the university. He deceased on October 6, 2013 in the Dutch town Nieuwegein. His long life was dedicated to physics. Science was his passion until the last day.

After finishing his secondary school education at the Stedelijk Gymnasium Leiden he started studying mathematics and physics at Leyden University in September 1939. After this university was closed by the Germans in November 1940 he moved to Groningen, where his uncle Frits Zernike held the chair of theoretical physics. He finished his studies there in 1947, and started working on his PhD thesis with Kramers at Leyden. Zernike and Kramers were his role models, and he always talked about them with deep appreciation. In 1948 and 1950, while working under Kramers, he wrote two articles on diffraction in optics [1],[2], based on his work with Zernike, recipient of the 1953 Nobel prize for the invention of the phase contrast microscope.

In his dissertation Van Kampen treated the quantum mechanical interaction of an electron with the electromagnetic field, elaborating Kramers’ ideas on renormalization. During his PhD studies he spent a year at Niels Bohr’s institute in Copenhagen, and in 1952 he graduated cum laude at the university of Leyden, only a few months before Kramers died. The title of his thesis was “Contribution to the quantum theory of light scattering” [3].

In 1952/1953 he worked as a research associate at the Institute of Advanced Study in Princeton, continuing his work on quantum mechanical scattering theory. He wrote two articles on the connections between the S-matrix and the causality condition [4],[5]. Returning to Leyden University he obtained a permanent position as a lecturer. His interests soon turned to statistical mechanics, as witnessed by two articles, entitled "Quantum statistics of irreversible processes" [6] and "On the derivation of reciprocal relations between irreversible processes" [7], the latter with S.R. de Groot. In these days
he also worked on plasma physics, especially on the dispersion relation for plasma waves and the related Landau damping. In his paper “On the theory of stationary waves in plasmas” [8] he introduced the well-known Van Kampen modes.

In 1955 Van Kampen was appointed associate professor at the University of Utrecht. In 1956 he published an extensive article "Grundlagen der statistischen Mechanik der irreversiblen Prozesse" [9], in which he discussed the irreversible evolution of macroscopic systems on the basis of quantum mechanics. The article builds on the ideas developed by Paul and Tatiana Ehrenfest in their famous Encyclopedia article of 1912 on irreversibility in classical statistical mechanics. Van Kampen deliberately continued the tradition Boltzmann-Ehrenfest-Kramers in statistical mechanics. In the 1956 article he laid down his deep ideas on the chaotic time evolution of dynamical systems. His frequent reaction to later developments was "They did not read my paper" (and in fact this was not the only paper this could be heard about).

In 1958 he was appointed full professor of theoretical nuclear physics at the University of Utrecht, a discipline he has not really worked in later on. His inaugural speech of May 25, 1959, entitled "Is natuurfkunde een wetenschap?" ("Is physics a science?") started off a series of philosophical essays on the nature of science, and physics in particular. The speech excels in lucid and pointed formulation, so characteristic of Van Kampen’s style.

Van Kampen cared strongly about the praxis of physics in The Netherlands. This resulted in several excellent and still relevant articles in the Nederlands Tijdschrift voor Natuurkunde, the journal of the Dutch physical society. The earlier ones amongst these, appearing between 1957 and 1963, were about specific physics subjects, such as the Fokker-Planck equation [10] or the Aharonov-Bohm effect [11], whereas most later ones, between 1984 and 1992, are about more general questions, like "Wat is wetenschap?" ("What is science?") and "Het post moderne obscurantisme" ("Postmodern obscure-antism").

During the nineteen-sixties Van Kampen published several memorable articles. In "A power series expansion of the master equation" [10] he developed the well-known $\Omega$-expansion, which to date goes under his name. In "A simplified cluster expansion for the classical real gas" [11] he put forward a very clever way of deriving the Mayer cluster expansion, and the article "Condensation of a classical gas with long-range attraction" [12] was one of the first papers in which a phase transition in a continuum system was derived in a strict mathematical way. It has served as a strong inspiration for further work by others, including even more rigorous derivations.

Other important work includes the book "Theoretical methods in plasma physics" [13], and the article "On the macroscopic theory of Van der Waals forces" [14]. In the well-known Festschrift article "The case against linear
response” [15], written in honor of Wergeland’s 60th birthday, Van Kampen explains his objections to a too mechanical acceptance of the Green-Kubo expressions for linear transport coefficients.

In many of his papers, published over an era of five decades, he treats the theory of fluctuations. His ongoing thorough study established Van Kampen as a world authority in this area. His book “Stochastic processes in physics and chemistry” [16], dedicated to the memory of F. Zernike, is an invaluable standard work. A revised and extended version appeared in 1992. The book is extremely clear and has been written with utter care for detail. It contains many highly original and useful exercises and is indispensable for anyone working in the field.

Two much-cited review articles on stochastic differential equations [17] and elimination of fast variables [18] give evidence of his mastery of mathematical methods. The articles impress by their wide scope and by the application of sophisticated methods to a variety of physical situations.

In more recent times he became interested in the foundations of quantum mechanics. An article on the collapse of the wave function [19] was followed by the construction of a model for the quantum mechanical measurement process. A concise summary of his conclusions can be found in “Ten theorems about quantum mechanical measurements” [20]. After this he submitted two letters to Physics World [21], [22], gave a summary at a Tokyo meeting [23], made an address to the Royal Dutch Academy of Sciences, and published several more articles. His last contribution was a letter to the “American Journal of Physics” entitled “The scandal of quantum mechanics” [24]. In this letter, among other issues, he debunks hidden-variable theories as well as the many-world interpretation of quantum mechanics. Its last sentence reads “Even now many physicists have not yet learned that they should adjust their ideas to the observed reality rather than the other way around.”

Van Kampen’s philosophical observations on science, especially statistical mechanics and quantum mechanics, and his tribute to some other physicists, Kramers in particular, have been collected in the book “Views of a physicist” [25], edited by his good friend Paul Meijer, another student of Kramers. His satirical book “Waanwetenschap” (“Fancy science”) [26] gives a “demonstration of the way one should use one’s mental capacities to separate the wheat from the chaff and to arrive at real knowledge”. Both books bear witness to his keen skeptical mind and his acute sense of humor.

Nico van Kampen was a scholar of the classical style. He studied problems in physics with passion and a contagious enthusiasm. He was a central person in Dutch theoretical physics, an oracle to many, and a stimulating discussion partner to all. He has at times been characterized as the conscience of Dutch physics. His verdicts were not always accepted, but they were always listened to. He was elected a member of The Royal Netherlands Academy of Arts and
Sciences in 1973, and was a quite loyal attender of its meetings until recently. He received an honorary doctorate from RWTH Aachen University in 1981, and was awarded the Koninklijke/Shell Prize in 1988. To his colleagues he was a dear friend and to his students a highly esteemed teacher. His critical sense and his great knowledge and wisdom will be dearly missed.”


Bibliography:
3 | Scientific highlights

This chapter describes two highlights of research in theoretical physics, presented from the personal point of view of members of the Research School who have been actively involved in them. One describes entanglement that plays a key role in research into the quantum structure of spacetime. This work belongs to theme 1 of the School and the contribution was written by Professor Erik Verlinde. A second highlight belongs to theme 2 and deals with interaction induced chiral $p_x + ip_y$ superfluid in optical lattices. This contribution was written by Professor Cristiane Morais Smith.

Black holes, space time and quantum entanglement
(Professor Erik Verlinde, University of Amsterdam)

Quantum entanglement plays a key role in research into the quantum structure of spacetime and black holes. Entanglement means that the quantum characteristics of two parts the quantum system are strongly related to each other. Scientists measure the degree of entanglement by determining the value of the entanglement entropy.

If the vacuum state of the spacetime is divided into two parts then the entanglement entropy of the spacetime is found to have a universal value. This value is equal to a quarter of the surface area of the separating wall. The existence of this quantum entanglement is an important condition for the continuity and regularity of spacetime.

Paradox
This new insight has led to a heated discussion about the nature of the event horizon of a black hole. When a pair of particles arises from the vacuum near such an event horizon, one of the particles can fall into the black hole while the other escapes in the form of radiation. Through this Hawking radiation the entanglement entropy of the black hole seems to increase. At the same time the black hole loses energy, as a result of which the area of its event horizon decreases and hence it reduces its quantum information.

In a recent article American researchers argue that the tension between the increasing entanglement on the one hand and the decreasing area of the event horizon on the other (and therefore reduced information) leads to the paradoxical conclusion that the event horizon is not a regular part of spacetime.
Regular horizon
Researchers from the FOM programme 'A String Theoretic Approach to Quantum Matter and Cosmology' have played an important role in these developments. In a series of articles (1, 2, 3, 4) the researchers have demonstrated that the entanglement between a black hole and the outside world can be used to reconstruct the interior of the black hole, as a result of which the regular character of the event horizon is retained.

Furthermore, in recent work the entanglement of a random area within the anti-de Sitter space has been calculated, and for the first time it was explicitly confirmed that this is the same as one quarter of the surface area. Both results are an important step forwards in the research into the quantum structure of spacetime.

Figure 3.1: What happens with Schrödinger's cat if this jumps into a black hole? The current scientific discussion about quantum entanglement at the event horizon of black holes can be viewed as a continuation of older familiar discussions, such as the EPR paradox and the quantum measurement problem ('Schrödinger's cat') in the context of quantum gravitation.
Interaction induced chiral $P_x + i P_y$ superfluid in optical lattices
(Professor Cristiane Morais Smith, Utrecht University)

The experimental realization of Bose-Einstein condensation (BEC) in 1995 with ultracold quantum gases -- a state of matter that had been theoretically predicted since 1925 -- has opened a new path in quantum optics. This achievement was possible due to the development of new laser cooling techniques, which allowed us to reach the micro- and later the nano-Kelvin regime. Moreover, the possibility to construct optical lattices by superimposing counter-propagating laser light in one, two, or three dimensions has brought further impulse to the field.

By loading the optical lattices with ultracold atoms, one obtains a tunable and accessible quantum system that can serve as a quantum simulator of more complex and unaccessible condensed-matter systems, thus realizing the visionary idea of Feynman. In particular, ultracold atoms in optical lattices are a paradigm for the realization of strongly correlated models relevant for understanding, for example, high-temperature superconductors. The lattice geometry and dimension can be designed at will, and the lattices are usually free of defects, although the latter can also be introduced in a controlled way. Moreover, the atoms loaded into the lattices can be fermions, bosons, or a mixture of both, and their interactions can be tuned from attractive to repulsive by using Feshbach resonances.

Several interesting properties of ultracold atoms have been understood by now, such as Bloch oscillations, the quantum phase transition from a bosonic Mott-insulator into a superfluid phase, the crossover from a BEC to a BCS phase, as well as the establishment of a fermionic Mott insulator, to cite just a few (see Refs. [1]-[3] for a review). However, most of the effort was concentrated on studying ground-state equilibrium properties. Ground-state Bose-Einstein condensates are s-wave like, and hence positive definite. If the cold-atom system should act as a quantum simulator for unconventional p- or d-wave superconductors, more complex order parameters are required, and one must achieve BEC in higher orbitals.

The first trials to generate higher-band Bose-Einstein condensates have failed because the lifetime of the excited states was too short to allow for condensation. Recently, this problem has been overcome in the group of A. Hemmerich in Hamburg, by using a bipartite optical lattice [4, 5]. In this case, the 2D optical lattice consists of a checkerboard of shallow and deep wells, and the overall first excited state is actually the ground state for the shallow wells. This trick increases the lifetime of this state considerably and allows for the observation of p-band Bose-Einstein condensates. The first observation of the phenomenon has hinted at the possibility of the creation of a $P_x + i P_y$ phase, which spontaneously breaks time-reversal symmetry and exhibits staggered currents [4]. However, other possible phases, such as an
incoherent mixture of $P_x$ and $P_y$ condensates, a coherent mixture, or phase separation, could not be ruled out because they would lead to the same experimental output.

The next step was then to include interactions to lift the degeneracy among these different ground states, and to introduce some anisotropies in the 2D lattice, to reach a finer control of the experimental system that could permit to unequivocally determine whether the realized phase was indeed the long-sought time-reversal symmetry breaking one. In condensed matter, the search for a $P_x + i P_y$ phase in unconventional superconductors has failed until now, with the exception of SrRu$_2$, for which the problem is still open [6]. These more refined experiments in bipartite optical lattices were performed in Hamburg, in the group of Andreas Hemmerich, and the theoretical calculations were performed in Utrecht, by Cristiane Morais Smith. The results obtained in the framework of a 3-band Hubbard model agree very well with the observations and confirm that indeed, a $P_x + i P_y$ phase driven by interactions is favorable, because in this phase the on-site Hubbard repulsion is minimized [7]. Staggered currents emerge in the system, and time-reversal symmetry is spontaneously broken.

Figure 3.2: In the center, a phase diagram obtained theoretically in the framework of the 3-band Hubbard model indicates the phases I and III, where striped phases occur ($P_x - P_y$ and $P_x + P_y$, respectively). In the central region II, a time-reversal symmetry breaking phase sets in. The experimental data shows time-of-flight images, which detect the order in k-space.
The experimental realization of bosonic order parameters with nodes, analogous to p- or d-wave superconductors, opens exciting perspectives for future research. The implementation of deeper potential wells should allow one to access a regime where Mott insulators with distinct orbital ordering is expected. In addition, if fermions are used instead of bosons, one could create new forms of topological matter. Cold atoms in higher bands are just in their infancy, but have already opened a fascinating arena where there should be many more surprises to come.

References


This chapter provides an overview of the educational program and of the PhD degrees granted in 2013. Research projects of current PhD students and data on their scientific and educational activities in 2013 are given.

The DRSTP offers a joint program of graduate education leading to a PhD. The educational program is based in part on the regular advanced courses, seminars and topical courses offered at the participating universities. The DRSTP organizes at least two postgraduate schools every year. Furthermore, students can gain international experience by attending (international) workshops or summer schools and, in certain cases, by making extended research visits abroad. The Governing Board is advised on educational matters by the Educational Board. Regular advanced courses at the universities are published in a nationwide survey at the beginning of each academic year.

The Governing Board of the DRSTP decides on admission of individual PhD students and monitors their progress.

An extended description of the selection and supervision procedure is presented in Appendix B.

4.1 Educational program

4.1.1. Postgraduate courses (AIO/OIO schools)

The following courses were given in 2013:

**Theoretical High Energy Physics (THEP)**
The DRSTP Postgraduate Course (AIO/OIO school) Theoretical High Energy Physics was held from 11 - 22 February 2013 at Hotel and Conference Center Landgoed Zonheuvel in Doorn, the Netherlands. The program was organized by R. Kleiss (RU), D. Roest (RUG) and PhD student B. Wouters (UvA). Twenty-six (26) students participated. Further information is available in Appendix C.

**Statistical Physics and Theory of Condensed Matter (SPTCM)**
The DRSTP Postgraduate Course (AIO/OIO school) Statistical Physics and Theory of Condensed Matter was held from 4 - 15 March 2013 at Hotel and Conference Center Landgoed Zonheuvel in Doorn, the Netherlands. The program was organized by R. Duine (UU), V. Vitelli and PhD student T. Fokkema (UvA). Twenty-six (26) students participated. Further information is available in Appendix C.
4.1.2. Symposium Trends in Theory 2013
Every other year the DRSTP organizes the symposium Trends in Theory. On 16 and 17 May 2013 the symposium was held for the tenth time. This symposium is part of the educational program for PhD students and students are encouraged to present a poster at this event. The symposium also provides an opportunity for members of the DRSTP to meet and share their ideas on recent developments in the area of theoretical physics. Further information is available in Appendix D.

4.1.3. PhD Day
On 27 September 2013 the DRSTP PhD Student Council organized their sixth PhD Day in Utrecht. Sixty-one people (61) attended of which forty-nine (49) were PhD students, eleven (11) were Master's students and one (1) participant and speaker was a former PhD student who is now employed at VGZ. Further information is available in Appendix E.

4.2 PhD degrees and subsequent employment
On 31 December 2013 one hundred and eleven (111) PhD students were affiliated with the DRSTP. Forty (40) PhD students joined the DRSTP in 2013 and twenty-nine (29) students were awarded their degrees. Information about career moves of former PhD students can be found in Appendix G.

4.3 PhD degrees granted in the DRSTP in 2013
In this section a short summary of the PhD theses published in 2013 is given. The summaries were provided by the students.

Akhukov, M.A. (RU)
thesis title: Structure and magnetism of defected carbon materials
advisors: Prof. A. Fasolino and Prof. M.I. Katsnelson
date: 25 February 2013
present position: unknown

In this thesis we have studied the structural and magnetic properties of different carbon systems like graphene edges, grain boundaries in graphene and disordered carbon with a focus on their magnetic properties. For each type of system we have found situations that might give rise to magnetic order if one would have enough control on the structure. The manuscript is organized as follows.
After the introductory chapter 1, in chapter 2 we have studied the 5-7 reconstruction of the zigzag graphene edges by a combination of first
principles and semi-empirical calculations. We have shown that this structure has the lowest energy also when spinpolarized calculations are performed. We have identified a reaction coordinate for the reconstruction that we have used to evaluate the free energy barrier by the technique of umbrella sampling in Monte Carlo simulations.

In chapter 3 we have examined the possibility to have grain boundaries in graphene with low formation energy and dangling bonds which can give rise to magnetic states. To construct grain boundaries we have adopted ideas of the theory of nanotubes. Our approach allows to model not only symmetric grain boundaries described in the standard 'coincidence site lattice' theory of grain boundaries in solids but also non symmetric ones which have higher energy and internal stress. For many possible structures we have studied the electronic properties and the influence of curvature on the magnetic properties as well as the influence of saturation of dangling bonds by hydrogen, hydroxyl group and oxygen. We have found a promising configuration with 5-8-7 rings where the dangling bonds give rise to magnetic states.

In chapter 4 we have studied the electronic and magnetic properties of nanoribbons terminated by nanotubes, a recently proposed low energy structure. We have found that, depending on the type of junction between the ribbon and nanotubes, many different properties can be realized, including magnetic states. Based on the found properties, we have proposed several possible applications of this type of systems for spintronics.

In chapter 5 we studied the magnetic properties of disordered carbon based on a ‘generate and test’ approach which samples the coordinate space to find magnetic configurations in pure carbon systems. We have discovered a wealth of structures with magnetic moments that could give ferromagnetic order. By comparing geometries with and without magnetic states we have identified a few criteria which have to be satisfied to expect magnetism in disordered carbon.

**Baarsma, J.E. (UU)**

thesis title: *Supersolid phases in mass imbalanced Fermi mixtures*

advisor: Prof. H.T.C. Stoof

date: 4 September 2013

present position: postdoctoral fellow, Aalto University, Helsinki, Finland

In this thesis, we study two-component Fermi mixtures in the presence of both a mass and a population imbalance. For a large part we focus on the experimentally available 6Li-40K mixture and on the phase transitions that can occur in this mixture.

In the first part of this thesis, we study the extremely polarized two-component Fermi gas with a mass imbalance in the strongly interacting regime. Specifically, we focus on the mixture of 6Li and 40K atoms. In this interaction regime spin polarons, i.e., dressed minority atoms, form. We consider the spectral function for the minority atoms, from which the lifetime and the effective mass of the spin polaron can be determined. Moreover, we
predict the radio-frequency spectrum and the momentum distribution for the spin polarons for experiments with 6Li and 40K atoms. Subsequently we study the relaxation of the motion of the Fermi polaron due to spin drag.

In the second part, we develop an accurate theory of resonantly interacting Fermi mixtures with both spin and mass imbalance. We consider Fermi mixtures with arbitrary mass imbalances, but focus in particular on the 6Li-40K mixture. We determine the phase diagram of the mixture for different interaction strengths that lie on the BCS side of the Feshbach resonance. We also determine the universal phase diagram at unitarity. We find for the mixtures with a sufficiently large mass imbalance, that includes the 6Li-40K mixture, a Lifshitz point in the universal phase diagram that signals an instability towards a supersolid phase.

In the last part of the thesis, we show that the ultracold three-dimensional 6Li-40K mixture at unitarity can exhibit the highly exotic Larkin-Ovchinnikov superfluid phase. We determine the phase diagram for majorities of 40K atoms within mean-field theory taking the inhomogeneities of the fermion states into account exactly. We find two different inhomogeneous superfluid phases in mixtures with a majority of 40K atoms, namely the Larkin-Ovchinnikov (LO) phase with one inhomogeneous direction and a cubic phase (LO3) where three spatial translational symmetries are broken. We determine the transition between these two phases by solving the Bogoliubov-de Gennes equations in the superfluid LO phase. Subsequently, we calculate the atomic density modulation of the atoms in the LO phase and show that it is sufficiently large to be visible in experiment.

Baggio, M. (UvA)
thesis title: Deformations of CFTs and holography
advisor: Prof. J. de Boer
date: 4 July 2013
present position: postdoctoral fellow, ETH Zurich, Switzerland

In this thesis we study several aspects of strongly coupled field theories and gravitational theories in the framework of holography. In the first part, we take some small steps towards an extension of the holographic dictionary to spacetimes that are not asymptotically AdS. More specifically, we study the situation where the background spacetime is asymptotically Lifshitz, a particular gravitational setup believed to be dual to strongly coupled theories that are non-relativistic. We then move on to study relativistic field theories that enjoy a large amount of supersymmetry, and in particular we present a proof that various observable quantities of such theories do not receive quantum corrections. This allows us to test some predictions coming from the holographic correspondence, providing further consistency checks of such duality. Finally, we study black holes and their entropy, once again in the holographic context. In particular we show that recent constructions concerning a putative CFT description for the entropy of various
asymptotically flat black holes can be interpreted as irrelevant deformations of holographic CFTs, and we discuss the implications of this result.

Belli, S. (UU)
thesis title: Symmetry breaking in suspensions of anisotropic colloids: phase transitions, diffusion and effective interactions
advisors: Prof. M. Dijkstra (UU) and Prof. R.H.H.G. van Roij
date: 26 June 2013
present position: financial analyst, Strategic Risk International, Chatswood, Australia

Colloids are particles with dimensions in between the nanometer and the micrometer suspended in a solvent. Similarly to the much smaller atoms and molecules, colloids appear in extremely different thermodynamic phases, such as gas, liquid, crystals and liquid crystals. Our interest focuses on the equilibrium thermodynamics of suspensions of anisotropic colloids, that is, colloids with a marked non-spherical shape. The non-spherical shape of these type of colloids allows to develop novel macroscopic phases. These phases are identified with the peculiar type of ordering in space that colloids assume, or, in more technical terms, with their degree of spontaneous symmetry breaking. The aim of this thesis consists of describing and understanding various aspects of the symmetry-broken phases generated by anisotropic colloids: the conditions for phase transitions, the character of the equilibrium diffusion, and the features of different effective interactions. The bare interactions between colloids are modeled as hard anisotropic repulsions. Besides reproducing experimental conditions common in colloid science, hard-particle models allow to investigate the many-body behavior of a system purely entropic terms, that is, independently of energy. Our analysis is based on the application of equilibrium classical statistical mechanics in the formulations of Density Functional Theory and Monte Carlo simulation. We study in Chapter 3 the effect of polydispersity on the liquid-crystal phase behavior of colloids having the shape of bricks (boardlike particles). We show that polydispersity appears to enhance the stability of the long-sought biaxial nematic liquid-crystal phase.

In Chapter 4 we demonstrate that a similar effect can be achieved by introducing a non-adsorbing depletant into the suspension. We suggest that by manipulating the resulting depletion interaction one can tune the liquid-crystal phase behavior of the particles.

In Chapter 5 we analyze the quality of a fundamental measure theory functional for the description of the freezing transition of model colloidal hard cubes and squares.

In Chapter 6 we focus on the effect of the broken symmetry on the diffusion and time relaxation of rod-like colloids.

Finally, in Chapter 7 we propose a simple theory for the description and prediction of the effective interactions between colloids induced by a solvent preferential adsorption.

Borghese, A. (RUG)
thesis title: *Cosmological and holographic applications of supergravity*
advisor: Prof. E.A. Bergshoeff
co-advisor: Dr. D. Roest
date: 18 October 2013
present position: postdoctoral fellow, Texas A&M University, USA

The thesis deals with four and five dimensional supergravity theories and their applications to the fields of cosmology and holography. The main focus is on the scalar sector of those theories. For what regards the application to cosmology, in the first part of the thesis it is studied the possibility to realise a period of inflation or stable de Sitter vacua in N=1,4,8 supergravity in four dimensions. In the part of the thesis dedicated to holography there is a detailed study of the scalar sector of N=8,four dimensional supergravity in specific truncated sectors. Finally a five dimensional model with N=2 is described which is dual to four dimensional field theories displaying a superconducting phase.

**Bzowski, A.W. (UvA)**
thesis title: *Conformal symmetry and holographic cosmology*
advisor: Prof. K. Skenderis
date: 10 September 2013
present position: unknown

This thesis presents a novel approach to cosmology using gauge/gravity duality. Analysis of the implications of conformal invariance in field theories leads to quantitative cosmological predictions which are in agreement with current data. Furthermore, holographic cosmology extends the theory of inflation beyond classical gravity.

**Čubrovič, M. (UL)**
thesis title: *Holography, Fermi surfaces and criticality*
advisor: Prof. J. Zaanen (UL)
date: 27 February 2013
present position: unknown

We employ the novel method of AdS/CFT correspondence to study strongly correlated fermions, their ground states and the phase transitions between them. AdS/CFT maps the quantum many-body problem to a classical gravity problem, making it more tractable. We find a holographic description of Fermi liquids and then proceed to find novel non-Fermi liquid ground states. In the future one can expect AdS/CFT to contribute toward our understanding of real world materials.
den Dunnen, W.J. (VUA)
thesis title: *Polarization effects in proton-proton collisions within the standard model and beyond*
advisors: Prof. D. Boer and Prof. P.J.G. Mulders
date: 15 February 2013
present position: postdoctoral fellow, University of Tübingen, Germany

In this thesis various effects of parton polarization in proton-proton collisions are considered. We discuss how quark polarization in transversely polarized protons can be used to search for physics beyond the Standard Model, we investigate the SM background to this process and we investigate how gluon polarization in unpolarized protons can be used to determine the parity of the Higgs boson. To achieve this, the framework of Transverse Momentum Dependent factorization was used which consistently takes into account partonic transverse momentum.

Fulga, I.C. (UL)
thesis title: *Scattering theory of topological phase transitions*
advisor: Prof. C.W.J. Beenakker
co-advisor: Dr. A.R. Akhmerov (TU Delft)
date: 21 November 2013
present position: postdoctoral fellow, Instituut-Lorentz, Leiden, the Netherlands; per 1 September 2014 postdoctoral fellow, Weismann Institute of Science, Rehovot, Israel

This thesis deals with characterizing topological phases as well as the transitions between them, focusing on transport properties and the effects of disorder.

In Chapters 2 and 3 we derived scattering matrix expressions for the topological invariants of systems. This approach is oftentimes numerically easier to evaluate than Hamiltonian expressions.

In Chapter 4 we predict novel transport features of the quantum Hall plateau transition, and efficiently estimate the associated critical exponent. In Chapter 5 we examine the universal properties of phase transitions in two-dimensional helical topological superconductors. We compute the critical exponents characterizing the divergence of the localization length, as well as the critical conductance.

In Chapter 6, we model a one-dimensional topological superconductor in a bottom-up fashion, as an array of coupled quantum dots. We show how to tune this system deep within the non-trivial phase, with well localized Majorana bound states at its ends.

In Chapter 7, we find a new class of disordered topological insulators protected not by an exact symmetry, but by an average symmetry of the disordered ensemble. This greatly increases the range of non-trivial phases, as every topological phase transition gives rise to infinitely many higher-dimensional topological phases.
Hartgring, L. (Nikhef)
thesis title: *Top quark spin and QCD corrections in event generation*
advisor: Prof. E.L.M.P. Laenen
date: 5 July 2013
present position: unknown

We investigated the use of polarization dependent observables to probe the Charged Higgs parameter space. Moreover we also investigated and proved the robustness of these observables under NLO and parton shower corrections. Assymetry parameters derived from the azimuthal and polar angle of the decay lepton show significant difference in complementary regions of the Charged Higgs parameters space and also between Charged Higgs and W-boson top-quark production. Energy observables were found be of use after applying a high cut on the boost parameter of the top quark. These observables can also be employed to distinguish between Wt and top pair production as we found significant differences after applying semi realistic Wt cuts. We have also studied polarization effects in the case of direct stop or sbottom pair production. Polarization holds information about mixing in the squark sector, mixing in the chargino/neutralino sectors as well as on the top velocity, hence on the mass difference between the squark and the neutralino/chargino. As the effectiveness of the searches is strongly influenced by the assumed polarization we provide an extensive investigation of the polarization throughout parameter space. Analysis of the kinematics of the decay products of the top arising from stop decay into a top and neutralino shows that the stop search is especially challenging in regions of parameter space that give rise to negatively polarized tops. Lastly we found that polarization dependent observables can be useful probes in the case of known sparticle masses. Additionally this thesis focusses on the development of a prescription allowing for subsequent NLO matching for the VINCIA parton shower. Starting with the case of electron positron scattering to two jets, the principle is derived for multiple cases of shower ordering. The case of smooth ordering, allowing for a restart scale slightly aboved the emission scale, is demonstrated to only affect subleading terms of the shower. Additionally we demonstrated the principle for a decay to three jets, by deriving a matching term for the exclusive cross-section. We find that ordering in transverse momentum, with a renormalization scale proportional to transverse momentum yields the best agreement with the one-loop matrix element. The results of the three jet prediction are found to be in good agreement with a large set of LEP event-shape, fragmentation and jet-rate observables.
Iakubovskyi, D. (UL)
thesis title: Constraining properties of dark matter particles using astrophysical data
advisor: Prof. A. Achúcarro
co-advisor: Dr. A. Boyarsky
date: 13 February 2013
present position: researcher, Bogoliubov Institute for Theoretical Physics, Kiev State University, Ukraine

A microscopic origin of dark matter phenomenon is the most plausible hypothesis to explain the mystery of dark matter. The dark matter particle hypothesis necessarily implies an extension of the Standard Model. In this thesis, we undertook a systematic model-independent program of studying the properties of decaying dark matter. By analyzing the experimental data for dwarf spheroidal galaxies it was shown that the X-ray energy range is a preferred region when searching for radiatively decaying dark matter. By analyzing dark matter distributions in different types of galaxies and in galaxy clusters we show that the expected dark matter signal increases slowly with the mass of the object. Therefore, dwarf and spiral galaxies are the observational targets with the optimal signal-to-noise ratio. To probe the theoretically interesting regions of particle physics models we performed a combined analysis of a very large dataset of archival XMM-Newton observations of galaxies. Finally, we discussed an ultimate way to probe the whole parameter space of minimal models of decaying dark matter. We argue that a new X-ray telescope with the narrow energy resolution (comparable to internal width of the line) and large field-of-view is required.

Jordan, S. (RU)
thesis title: Globally and locally causal dynamical triangulations
advisor: Prof. R. Loll
date: 16 October 2013
present position: postdoctoral fellow, Institut für Wissenschaftliches Rechnen (IWR), EMCL Group, Heidelberg, Germany

This thesis focuses on a particular proposal for a quantum theory of gravity called Causal Dynamical Triangulations (CDT). A question of central importance is whether CDT has a continuum limit. To address this question we have analyzed the phase transitions of the model and have found, that one of the two transitions of interest is a second order transition. This result is of high importance because the presence of a second order transition is necessary for a continuum limit to exist. We also discuss the possibility that a continuum limit of CDT may be related to Horava-Lifshitz gravity, based on the observation that both approaches have several key properties in common.

In the second part of the thesis we analyze the question whether the foliated structure of CDT is necessary to define a quantum theory of gravity which at large length scales is consistent with observations. We propose a new variant
of CDT where the foliation constraint is relaxed while causality is still preserved. Using newly developed simulation software we show that in the case of 2+1 dimensions the new model has similar low-energy properties as standard CDT. Therefore we conjecture that similar results can be expected in the realistic case of 3+1 dimensions and that the foliation constraint is not an essential ingredient for defining a quantum theory of gravity.

Lanzani, G. (UL)
thesis title: DNA mechanics inside plectonemes, nucleosomes and chromatin fibers
advisor: Prof. H. Schiessel
date: 2 October 2013
present position: advisor, KPMG until October 2013; Data Whisperer, GoDataDriven (software solutions), Hilversum, the Netherlands

With the aim of better understanding the compaction and de-compaction of DNA we have studied the driving forces in the equilibrium of the chromatin fiber. The chromatin fiber is a cylinder that reduces the space needed to store the genetic code. To explain how the genetic code trapped in the chromatin is accessed, we have shown how it is possible to (transiently) unwrap DNA from the nucleosomes, the constituents of the core of the chromatin. Finally, we have studied the effects of torque and tension on naked DNA.

Mooij, S.J.N. (Nikhef)
thesis title: Effective theories in cosmology
advisor: Prof. E.L.M.P. Laenen
co-advisor: Dr. M. Postma
date: 24 September 2013
present position: postdoctoral fellow, FCFM, Universidad de Chile, Santiago, Chile

The research done in my thesis focuses on various aspects of an effective description of cosmological inflation. Inflation is a short period in the very early universe during which the universe expands dramatically. We have studied the scenario of Higgs inflation, in which it is the Higgs field that drives inflation. In particular, we have checked the subtle effects coming from the rolling of the Higgs field during inflation. Next to that, we have studied the embedding of inflation in a supergravitational framework. In one project we have investigated how far the physics of inflation can be decoupled from the physics of its supergravitational embedding. In another project, we have shown how a particular model of inflation in supergravity can be viewed as a low-energy effective description of a unified string theory model. Finally, we have looked at a model in which the inflaton is coupled to an extra field, and found how its available parameter space is most critically constrained by the production of primordial black holes.
Oberreuter, J.M. (UvA)
thesis title: *The universe on edge: limits of the effective field theory approach in the very early universe*
advisor: Prof. E.P. Verlinde
co-advisors: Dr. K.E. Schalm and Dr. J.P. van der Schaar
date: 29 May 2013
present position: postdoctoral fellow, Göttingen University, Germany

In a way, physics is still recovering from the 1896 revolution started by Max Planck in Berlin, then being fostered in Gottingen and from there finally conquering the world: the conception of quantum mechanics. The fact that objects on a very small scale such as atoms, atomic nuclei and photons behave qualitatively very different from our everyday experience is not only puzzling the layman, but still ignites a lot of discussions in physics. A very important one is, how this theory tallies with the other big theory developed around the beginning of the previous century, namely the theory of relativity.

Conclusion: Examining the cosmology of the very early universe within a fundamental theory like string theory is necessary and exciting but dangerous. On the one hand, string theory has new features and techniques, which allow us to study the cosmological problems in a qualitatively different fashion. My results indicate that some of the gravest problems might be solved by string theory. On the other hand, string theory is beyond human control. One must be careful that one has really taken all the effects into account, which might well silently been reintroduce the problems one has set out to solve.

Meanwhile, advances in cosmology such as the ones reported in this thesis are well capable of satisfying the human curiosity and the frontier of exploration is yet again pushed ahead a bit.

Panfil, M.K. (UvA) (CUM LAUDE)
thesis title: *Density fluctuations in the 1D Bose gas*
advisor: Prof. J.-S. Caux
date: 9 October 2013
present position: postdoctoral fellow, SISSA, Trieste, Italy

The one-dimensional (1D) Bose gas offers an example of a complex problem with an exact solution. Miłosz Panfil has described the dynamics of particles in a one-dimensional world in which movement is limited to a finite line.
Pikulin, D.I. (UL)  
thesis title: *On topological properties of superconducting nanowires*  
advisors: Prof. C.W.J. Beenakker  
co-advisor: Prof. Yu. V. Nazarov (TU Delft)  
date: 26 November 2013  
present position: postdoctoral fellow, Instituut-Lorentz, Leiden, the Netherlands  

Topological superconductivity is a novel phenomenon, that has recently been predicted to exist in quantum wires. The first signatures of this new superconducting state have recently been reported. The difference with usual superconductors is the appearance of conducting edge states. It is of interest to investigate how all the well-known effects of superconductivity, including Andreev reflection and Josephson effect, are modified by these edge states, and also to discover new effects that appear only in topological superconductors. This investigation is the main topic of the thesis.

Rademaker, L. (UL)  
thesis title: *Fermions and bosons: excitons in strongly correlated materials*  
advisors: Prof. J. Zaanen  
co-advisor: Prof. H. Hilgenkamp (TU Eindhoven/UL)  
date: 11 December 2013  
present position: postdoctoral fellow, Instituut-Lorentz, Leiden, the Netherlands  

This thesis involves excitonic physics in bilayers of strongly correlated electron materials. The fermionic bilayer extended Hubbard model is studied by means of mean field theory and Determinant Quantum Monte Carlo simulations. A bosonic low-energy effective theory is developed, called the exciton t-J model. The phase diagram and the elementary excitations of this model are investigated. Surprisingly, the excitons are predicted to exhibit Ising confinement physics in the antiferromagnetic phase. In the exciton superfluid phase the magnetic triplon modes borrow kinetic energy from the excitons.

Reker, S.F. (RUG)  
thesis title: *Four flavours of twisted mass fermions*  
advisor: Prof. E.P. Pallante  
date: 21 October 2013  
present position: research geophysicist, Shell Global Solutions International BV, Amsterdam, the Netherlands  

Lattice QCD is a branch of theoretical physics that is concerned with the computation of processes and properties of particles governed by the strong force: quantum chromodynamics. These computations are performed on supercomputers such as the IBM Blue Gene/P in Groningen.
There are a number of distinct formulations of Lattice QCD and my research has focused on only one of these formulations: twisted mass Lattice QCD. My research has been conducted in the context of a European collaboration with the name: European Twisted Mass Collaboration or ETMC. The goal of our research was to investigate whether quantum chromodynamics is the correct description of subatomic processes influenced by the strong force and at low energy.

More specifically, our collaboration has looked at the effect the incorporation of the fourth quark has on computations. We were one of the first groups to study the effects of the fourth quark. Our research has shown that the influence of the fourth quark on processes and properties that we have study is barely noticeable. This was expected, but had not been shown explicitly before.

My dissertation describes many of the technical details that are necessary to come to a clean calculation of these processes and properties, as well as a technique to efficiently write large data files. The last chapter is somewhat separate and is the result of a collaboration (aimed at numerical aspects) with a chemistry group.

Smolic, J. (UvA)
thesis title: Aspects of holography: from weak to strong coupling
advisor: Prof. K. Skenderis
co-advisor: Dr. M. Taylor
date: 17 April 2013
present position: unknown

The concept of holography is a strong-weak coupling duality stating the equivalence of a gravitational theory living in a (d+1)-dimensional bulk spacetime and the d-dimensional non-gravitational gauge theory living on its boundary. It is a remarkably useful tool. In this thesis we study various aspects of holography at different values of the gauge coupling constant. In the weak coupling regime we study the N = 4 SYM theory in a non-equilibrium setting, using the tools of n Particle Irreducible (nPI) effective actions. We compute the 2PI effective action, to two loops, and the evolution equations for the two-point correlators of this theory. This could potentially give us information about the strongly-coupled gravity theory. In the strong coupling regime we derive the holographic dictionary for a class of Einstein-Maxwell-Dilaton theories and study their hydrodynamics. Many of the relevant solutions do not have AdS asymptotics, and we make use of generalized dimensional reduction, which allows us to set up the dictionary using a theory whose dictionary is already known. Finally, we tune the coupling slightly back towards the weak-coupling regime and look for black hole solutions in various theories of higher derivative gravity. Specifically, we look at higher-derivative effects in 4-dimensional AdS black holes, and work out the thermodynamics of these corrected black hole solutions.
**Smolic, M. (UvA)**
thesis title: *Holography out of equilibrium*
advisor: Prof. K. Skenderis
co-advisor: Dr. M. Taylor
date: 17 April 2013
present position: postdoctoral fellow, Netherlands Cancer Institute, Antoni van Leeuwenhoek, Amsterdam, the Netherlands

Using holography it is possible to write down the dissipative hydrodynamic behaviour of a boundary field theory which describes a non-conformal fluid. It is also possible to write down the evolution equations of the two-point correlators for the various field present within the cornerstone field theory in the AdS/CFT correspondence. Studying out-of-equilibrium phenomena in this way might lead us to discover the process of, among other things, black hole formation/evaporation. Studying black holes had proved a vital ingredient in searching for a unifying theory of quantum mechanics and general relativity.

**Upadhyaya, N. (UL)**
thesis title: *Solitary waves and fluctuations in fragile matter*
advisor: Prof. M. van Hecke
co-advisor: Dr. V. Vitelli
date: 5 November 2013
present position: postdoctoral fellow, Instituut-Lorentz, Leiden, the Netherlands

In this thesis, we study energy transport and fluctuations in simple models of fragile matter: a unique state of matter that has a vanishingly small window of linear response since one or both of its elastic moduli (shear and bulk) are nearly zero. As a consequence, even the tiniest perturbations travel as nonlinear waves. In addition, most models of fragile matter have an amorphous structure. It is the interaction of the non-linear waves with the underlying disorder and the resulting fluctuations, that constitutes the unifying theme explored in this thesis. There are at least two seemingly distinct sources of fragility: a local source stemming from the strongly non-linear interaction potential between particles so that one can not expand around a potential minimum to define a spring constant, and a second, global source, whereby the collective response of the sample can be considered weakly linear. As a model of the first kind, we consider a two dimensional packing of soft frictionless elastic disks that are just touching their nearest neighbours. The interaction potential between elastic disks is given by the nonlinear Hertz law that has no harmonic part. Consequently, for a packing in this state, the bulk modulus is vanishingly small and the smallest compressions imparted at the edges leads to nonlinear solitary like waves. As a model of the second kind, we consider a two dimensional random network of harmonic springs where each node has on average around four nearest neighbours. Here, despite the contact interaction being harmonic, the
network has a vanishingly small shear modulus. Consequently, even the tiniest shear strains elicit non-linear waves. There are many important similarities and differences between the nature of non-linear waves and the role played by disorder in the two models described above, which we are gradually beginning to understand.

**van Gelderen, R. (UU)**
thesis title: *Spin-orbit coupling and magnetism in multilayer graphene*
advisor: Prof. C. Morais Smith
date: 7 June 2013
present position: customer intelligence analyst, Aegon Nederland, the Hague, the Netherlands

The topics covered in this work are:
- spin-density-wave instabilities in monolayer graphene doped to the van Hove singularity. Nesting of the Fermi surface and a diverging density of states are often ingredients for charge and/or magnetic instabilities. For highly doped monolayer graphene these conditions are satisfied. In this thesis a path integral approach is used to show that a spin-density-wave is the leading instability.
- spin-orbit interactions in bilayer graphene with next-nearest neighbor interactions. Intrinsic spin-orbit interactions open a gap in the spectrum of monolayer graphene. It is shown that this is also true for bilayers. However, the Rashba spin-orbit coupling has a surprising effect in bilayer graphene. One of the parabolic bands becomes conical. This conical behavior persists when next-nearest-hopping parameters are included in the theory.
- ferromagnetic instabilities due to the exchange mechanism in both ABA-stacked trilayer and ABC-stacked trilayer graphene systems. Electrons gain exchange energy by aligning their spins. Due to the Pauli exclusion principle an increase in kinetic energy is accompanying this spin alignment. A variational approach is used to show that ferromagnetic and band-ferromagnetic configurations exist in ABA-stacked trilayers. For ABC-stacked trilayers the ferromagnetic phase space is increased a factor of 25 compared with bilayer graphene, even when a simplified model of screening is taken into account.
For the ABC-stacked multilayer screening is important, since the density of states diverges at the Dirac point as the number of layers equals three or more. A chapter is dedicated to calculate the polarization and screened Coulomb potentials in ABC-stacked multilayer graphene. An effective two-band model is used for the small momentum behavior, but the linear dependence of the polarization for large momenta is confirmed in the full-band model for ABC-stacked trilayer graphene.
van Heugten, J.J.R.M. (UU)
thesis title: *Unitary quantum gases: from cold atoms to quark-gluon plasmas*
advisor: Prof. H.T.C. Stoof
date: 14 June 2013
present position: postdoctoral fellow, Radboud University Nijmegen, the Netherlands

We investigate the many-body properties of two distinct degenerate systems with strong interactions, namely that of a quark-gluon plasma and of an atomic Bose gas. In the first part of this thesis, the temperature dependence of the thermodynamic potential of quantum chromodynamics is studied. In particular, the specific heat and the quark effective mass are calculated for imbalanced quark matter in the limit of a large number of quark flavors (large-Nf), which corresponds to the random phase approximation. Also, a generalization of the Landau effective-mass relation for the imbalanced case within relativistic Landau-Fermi liquid theory is derived. The effects of imbalance is expected to have important consequences on the properties of quark matter in the core of neutron stars. In the second part, we develop an analytical approach for the description of the crossover of an atomic Bose gas from small to infinitely large scattering length (unitarity). We obtain several properties of the Bose gas as a function of interaction strength, such as the chemical potential, the contact, the speed of sound, the condensate density, the effective interatomic interaction and the three-body recombination rate. It is shown how the approach can be systematically improved with renormalization-group methods and that it reduces to the Bogoliubov theory in the weak-coupling limit.

van Tongeren, S. (UU)
thesis title: *Quantum field theory through a stringy mirror: integrability of the AdS5xS5 superstring and its deformations*
advisor: Dr. G.E. Arutyunov
date: 11 July 2013
present position: postdoctoral fellow, Humboldt University, Berlin, Germany

Describing quantum field theories at finite coupling is a daunting open problem in theoretical physics. One particular theory where we are able to gain valuable insight is planar N=4 supersymmetric Yang-Mills theory (SYM), related to superstring theory on AdS5 x S5 through the AdS/CFT correspondence. Thanks to integrable structures in both theories we can compute the energy spectrum of the string exactly, giving us the spectrum of scaling dimensions in N=4 SYM at finite coupling. In this thesis we firstly briefly review the computation of energy spectra in two-dimensional integrable quantum field theories by means of the (mirror) thermodynamic Bethe ansatz and show how this applies to the AdS5 x S5 superstring. We then fully extend these considerations to various integrable deformations of the superstring and its dual N=4 SYM, breaking some or all of the supersymmetry. We also discuss the application of these methods to a
particularly complicated type of excited string state with complex momenta. Finally we consider deformations of the integrable structure of the superstring related to Pohlmeyer reduced string theory and find the corresponding thermodynamic Bethe ansatz equations which exhibit remarkable features.

Weenink, J.G. (UU)
thesis title: *Gauge invariance and frame independence in cosmology*
advisor: Prof. E.L.M.P. Laenen
co-advisor: Dr. T. Prokopec
date: 30 September 2013
present position: design engineer focus application, ASML, Veldhoven, the Netherlands

In this thesis the mathematical formulation of cosmological perturbations is studied. First we discuss the gauge problem of general relativity: perturbations of the metric and matter fields in an expanding universe are dependent on the choice of coordinate system, i.e. gauge dependent, even though the complete, unperturbed theory is covariant. Secondly, we discuss the frame problem of perturbations: the action for a universe with scalar field matter can be formulated in two different ways, in the Jordan or Einstein frame. These formulations are related by redefinitions of the metric and scalar field, and are therefore physically equivalent. However, perturbations in one frame and another are related by non-linear redefinitions, which makes it complicated to see how to formulate physical correlation functions.

In this thesis we show that it is possible to express the action for perturbations in terms of gauge invariant and frame independent perturbations. These perturbations are then used to compute physical correlation functions which are independent of coordinate reparametrizations or field redefinitions. We first compute the second order action for linear perturbations. Later we outline a procedure to compute the action for non-linear perturbations, and apply this to find the gauge invariant action for second order perturbations. We furthermore show that there are different gauge invariant variables related by non-linear redefinitions, but that their actions are only related by boundary terms, such that the evolution of non-Gaussianity is unique. Moreover, as a final application we use the formulation of the action in terms of gauge invariant and frame independent variables in order to readdress the naturalness in Higgs inflation. In this formulation, Higgs inflation does not suffer from unitarity problems.
**Wever, C.S.P. (UU)**

thesis title: *Soft and Coulomb resummation: squark and gluino production at the LHC*

advisor: Prof. G. 't Hooft

date: 27 May 2013

present position: windsurf instructor and coach, Sailing School Oer 't Hout, Grou, Friesland, the Netherlands

In this PhD thesis we have studied the production of massive particles at the Large Hadron Collider (LHC). We found very large corrections that can be compared with experimental results. The LHC is a big particle accelerator at CERN, Geneva where protons are collided against each other. After such high-energy proton collisions, different particles are produced, including massive particles. The experimentalists measure the cross section, which is related to the production rate, that specific massive particles are produced which are then subsequently compared with theoretical predictions from the theory called Quantum Chromodynamics (QCD). Because of the large mass of these particles, they have a small velocity after being produced and it can be shown in QCD that the cross section for their production can be expressed as a series in large numbers. These large numbers make it seat first that the cross section does not converge, but in the last few decades methods have been developed that reorder the series such that it becomes possible to sum some subseries. The application of these methods is called resummation. In this thesis we have explained and reviewed the resummation method based on Effective Field Theories (EFT), performed directly in momentum space. We were interested in the production of squarks and gluinos that are massive particles that have not been detected up till now at the LHC. The squarks and gluinos are hypothetical particles which appear in some theories of supersymmetry (SUSY). These theories of SUSY have gained fame because of their ability to solve some of the fundamental problems in physics. Therefore, it is important to calculate the cross sections of squark and gluino production at the LHC as accurately as possible. The results of this thesis give a better and more accurate prediction of the cross sections by making use of resummation methods and are needed to make more reliable comparisons of SUSY models with the experimental results at the LHC.

**Woldhuis, E.L. (UL)**

thesis title: *Foam rheology near the jamming transition*

advisor: Prof. M. van Hecke (UL)

co-advisor: Dr. B. Tighe (TU Delft)

date: 11 December 2013

present position: teacher

When soft, repulsive particles, like foam bubbles or emulsion droplets, are sheared, they show interesting scaling behaviour. We develop a simple scaling model that captures the rheological behavior starting from three assumptions that explicitly depend on the microscopic interactions. This
model starts from three ingredients: energy conservation, the concept of an effective steady state strain in our flowing system and a constitutive elasticity equation linking the effective strain to the shear stress. Our model allows for non-linear microscopic particle interactions and it predicts that the global rheological behaviour depends on the details of the microscopic interactions between the particles - in contrast to standard critical scaling theory. We test our model in computer simulations of soft, massless particles under steady shear and find that the numerics are broadly consistent with our model. jamming, rheology, foam, critical scaling.

**Yin, Y. (RUG)**
thesis title: *Extensions of three-dimensional higher-derivative gravity*
advisors: Prof. E.A. Bergshoeff and Prof. M. de Roo
date: 11 October 2013
present position: researcher, Centre for Theoretical Physics, Groningen, the Netherlands

The New Massive Gravity (NMG) and the Topologically Massive Gravity (TMG) are toy models of modified general relativity in three-dimensional spacetime, which contain massive spin-2 particles. The thesis shows, at least for the free theory on the flat background, that NMG and TMG can be extended to higher-spin models and that in some situations these models can be further extended to higher spacetime dimensions. Supersymmetric NMG is also discussed in the thesis.

### 4.4 Other PhD's advised by DRSTP staff

**Pang, X. (VUA)**
thesis title: *Guises of Gouy: the phase anomaly in optical wavefields*
advisor: Prof. T.D. Visser
date: 5 November 2013
present position: postdoctoral fellow, Northwestern Polytechnical University, Xi'an, China

**Raghunathan, S. (VUA)**
thesis title: *Studies in physical optics; coherence theory and surface plasmons*
advisors: Prof. T.D. Visser and Prof. W.M.G. Ubachs
date: 13 May 2013
present position: postdoctoral fellow, TU Delft, the Netherlands

**Rechenberger, S. (RU)**
thesis title: *Quantum Einstein gravity: the metric and the foliated formulation*
advisor: Prof. R. Loll
co-advisor: Dr F.S. Saueressig
date: 21 November 2013
present position: postdoctoral fellow, Technische Universität Darmstadt, Germany

4.5 PhD students (per 31-12-2013)

This section gives an overview of the PhD students affiliated to the DRSTP on 31 December 2013. The projects are chronologically ordered according to starting date. The research themes mentioned refer to particle physics, cosmology, quantum gravity and string theory (theme 1) and quantum matter, quantum information, soft condensed matter and biophysics (theme 2).

University of Amsterdam (UvA)

− Haaker, S.M. as of 1 October 2009 with K. Schoutens.
  project: topological quantum computation - fractional quantum Hall effect devices (theme 2).

− Caldeira Costa, R.N. as of 24 November 2009 with M. Taylor (E.P. Verlinde, formal advisor).
  project: holography and black hole dynamics; use of gravity gauge duality to explore singularity resolutions (theme 1).

− Holsheimer, K. as of 1 September 2010 with J. de Boer.
  project: applications of the AdS-CFT correspondence to non-relativistic systems, with possible applications to strongly coupled condensed matter systems (theme 1).

− Korovin, Y. as of 1 September 2010 with K. Skenderis.
  project: string theory in AdS spacetimes (theme 1).

− Wouters, B.M. as of 1 October 2010 with E.P. Verlinde.
  project: string theory and the emergence of gravity (theme 1).

− Eliëns, I.S. as of 1 September 2011 with J.-S. Caux (K. Schoutens, formal advisor).
  project: to provide the theory support in the search for and recognition of Luttinger liquid behaviour in the planned experiments by other teams (theme 2).

− Mayerson, D.R. as of 1 September 2011 with J. de Boer.
  project: research in the topic of the AdS/CFT correspondence, a conjecture in string theory that makes it possible to study strongly coupled field theories holographically using gravity models. An especially active topic at the moment is applications of AdS/CFT to condensed matter theory,
which includes the study of holographic models for superconductors and (non-)fermi liquids (theme 1).

- Mosk, B. as of 1 September 2011 with J.P. van der Schaar (J. de Boer, formal advisor).
  project: to investigate how the vacuum evolves if compact dimensions grow in size and to what kind of excitations such an evolution might lead (theme 1).

- Fokkema, T.B. as of 12 September 2011 with J.-S. Caux (K. Schoutens, formal advisor).
  project: focus on the theory for the in- and out-of-equilibrium dynamics of interacting Bose gases, using the exact integrability of the underlying systas a base (theme 2).

- de Lange, P. as of 13 September 2011 with E.P. Verlinde.
  project: most prominently the fundamental role of space-time will be investigated by considering both black-hole solutions in string theory and both sides of the AdS/CFT conjecture (theme 1).

- De Nardis, J. as of 1 October 2011 with J.-S. Caux (K. Schoutens, formal advisor).
  project: the main focus will be on the calculation of observable dynamical response functions such as spin-spin correlations (theme 2).

- Pinzani Fokeeva, D. as of 19 October 2011 with M.M. Taylor (K. Skenderis, formal advisor).
  project: development of holographic models for condensed matter systems (theme 1).

- Wegloop, A.J. as of 1 November 2011 with E.P. Verlinde.
  project: string theory and the emergence of gravity (theme 1).
  End of contract: 12 July 2013.

- Feher, G. as of 1 February 2012 with B. Nienhuis.
  project: exact correlation functions from qKZ equations (theme 2).

- van den Berg, R. as of 1 September 2012 with J.-S. Caux.
  project: study of Gaudin models and spin chains with possible applications to experiments (theme 2).

- Vlijm, R.P. as of 1 September 2012 with J.-S. Caux.
  project: low dimensional magnetism in and out of equilibrium; correlation functions of spin chains using Algebraic Bethe Ansatz approach (theme 2).
- Rietkerk, R.J. as of 15 September 2012 with E.L.M.P. Laenen.  
  project: computing (quantum corrections) to top and Higgs collider processes. Develop (automated) tools thereto (theme 1).

- Bjerngaard, M. as of 1 October 2012 with A. Turner (K. Schoutens, formal advisor).  
  project: to understand the nature of topological states, in particular, their experimental properties and the effects of interaction and disorder. The Weyl metal is first case study (theme 2).

- Silverwood, H.G.M. as of 1 October 2012 with G.F. Bertone (J. de Boer, formal advisor).  
  project: astroparticle phenomenology specifically direct and indirect dark matter detection, and determination of local properties of the dark matter hole (theme 1).

- Ilgin, I. as of 1 November 2012 with A. Turner (E.P. Verlinde, formal advisor).  
  project: to study and develop the principles behind the emergence of space time in physical contexts with event horizons, such as black holes, as well as horizon-free settings (theme 1).

- Cohen, D. as of 15 September 2013 with A. Castro (J. de Boer, formal advisor).  
  project: research is related with the Kerr/CFT duality. It is known that in the extremal Kerr black hole, the near horizon quantum states can be identified with two dimensional conformal field theory. In the non extremal case, though we can’t do the same approach that the extremal case to show this duality, the scalar wave equation show a conformal group symmetry which show insights that somehow this property is present even if the black hole is not extremal. Understanding this is still an open question and it’s relevance is related with the fact that the Kerr black hole is potentially related with physical objects in our Universe. (theme 1).

- Dimitrakopoulos, F. as of 1 September 2013 with B. Freivogel (J. de Boer, formal advisor).  
  project: topics in classical and quantum gravity, cosmology and string theory: stability of anti de Sitter and asymptotically anti de Sitter spacetimes, the quantum initial state and topics in conformal field theories (theme 1).

- Feyereisen, M.R. as of 1 September 2013 with S. Ando (J. de Boer, formal advisor).  
  project: to study the γ-ray flux probability distribution from dark matter annihilation in extragalactic holes. The γ-ray luminosity of blazars (a known background for the annihilation signal) is also studied (theme 1).
− Kabir, L. as of 1 September 2013 with B. Freivogel and J.P. van der Schaar (Prof. J. de Boer, formal advisor).
  project: quantum gravity and cosmology (theme 1).

− Arvidsson Liem, S. as of 2 September 2013 with G.F. Bertone (J. de Boer, formal advisor).
  project: searching for dark matter at the LHC and with astroparticle experiments (theme 1).

− Jefferson, R.A. as of 15 September 2013 with B. Freivogel (E.P. Verlinde, formal advisor).
  project: connecting quantum gravity to cosmology (theme 1).

− Diamanti, R.D. as of 1 October 2013 with S. Ando and G.F. Bertone (J. de Boer, formal advisor).
  project: implication of particle physics models for indirect dark matter searches (theme 1).

Vrije Universiteit Amsterdam (VUA)
− Buffing, M.G.A. as of 1 September 2011 with P.J.G. Mulders.
  project: transverse momentum dependent gluon distributions and color gauge invariance (theme 1).

  project: development of computational models for fiber networks (theme 2).

− Signori, A. as of 1 November 2012 with P.J.G. Mulders.
  project: theoretical aspects of transverse momentum dependent parton distribution functions as part of the FOM project "QCD at work in the Higgs sector" (theme 1).

University of Groningen (RUG)
− Andringa, R. as of 1 September 2008 with E.A. Bergshoeff.
  project: properties of gravitational theories in three-dimensional space-time, in particular with regard to contributions of higher order in the curvature, and to black holes (theme 1).

  project: theory of Lorentz and CPT violation in the weak interaction (theme 1).

− Romanets, O. as of 1 October 2009 with R.G.E. Timmermans.
  project: improving the theoretical framework for open charm embedding not only D, but also DS and D*s (theme 1).

− de Haan, S. as of 13 September 2010 with E.A. Bergshoeff.
project: understanding a new model of gravity in three space-time dimensions and looking for applications (theme 1).

- Nunes da Silva, T.J. as of 1 October 2010 with E. Pallante.
  project: understanding how conformality is restored in non-abelian gauge theories and its consequences, with particular focus on LHC physics (theme 1).

- Merbis, W. as of 1 November 2010 with E.A. Bergshoeff.
  project: to look for applications of string theory using the so-called AdS-CFT correspondence at different distance scales. This research is embedded into the national string program (theme 1).

  project: parity violation and weak charges of quarks (theme 1).

- Kovačevič, M. as of 1 October 2011 with E.A. Bergshoeff.
  project: gravity in three dimensions as a road to quantum gravity (theme 1).

  project: theory beyond the standard model of particle physics in $\beta$-decay (theme 1).

- Zojer, T. as of 1 January 2012 with E.A. Bergshoeff.
  project: higher-spin and higher-derivative gravity (theme 1).

- Scalisi, M. as of 1 April 2012 with D. Roest (E.A. Bergshoeff, formal advisor).
  project: signatures of string inflation (theme 1).

- Parra Rodriguez, L. as of 1 April 2013 with E.A. Bergshoeff.
  project: extensions of gravity both to include higher-derivative terms in the Riemann curvature as well as to higher spins; new massive gravity (theme 1).

- Basanisi, L. as of 1 September 2013 with E.A. Bergshoeff.
  project: first aim: investigate models of three-dimensional gravity; second aim: investigate the role of branes in string theory in particular their classification and their relation to different proposals for the geometry underlying string theory (theme 1).

- Galante, M. as of 1 September 2013 with D. Roest (E.A. Bergshoeff, formal advisor).
project: study of the new one parameter family of SO(8) gauged supergravities. In particular, inflation scenarios and cosmological implications of that theory (theme 1).

- Alkac, G. as of 15 October 2013 with E.A. Bergshoeff.
  project: models of gravity in three spacetime dimensions, especially their supersymmetric and higher spin extensions (theme 1).

**Leiden University (UL)**
- van Ostaay, J. as of 1 September 2009 with C.W.J. Beenakker.
  project: majorana fermions in topological insulators and graphene (theme 2).

- Ortiz, P. as of 1 September 2010 with A. Achúcarro and J.-W. van Holten
  project: theoretical cosmology, with a special emphasis on theories and models of inflation in the early universe (theme 1).

- Koning, V. as of 1 November 2010 with V. Vitelli (M. van Hecke, formal advisor).
  project: to study crystal order fracture and phase nucleation on a curved substrate (theme 2).

- van Heck, B. as of 1 June 2011 with C.W.J. Beenakker.
  project: quantum transport in topological isulators and graphene (theme 2).

- Bagrov, A. as of 1 September 2011 with K.E. Schalm (J. Zaanen, formal advisor).
  project: application of AdS/DFT to condensed matter physics and quantum criticality in particular (theme 2).

- Goykhman, M. as of 1 September 2011 with A. Parnachev (J. Zaanen, formal advisor).
  project: studying strongly interacting matter with string theory (theme 2). PhD exam: 24 June 2014.

- Mi, S. as of 1 September 2011 with C.W.J. Beenakker.
  project: transport properties of topological insulators and graphene (theme 2).

- Atal, V. as of 1 October 2011 with A. Achúcarro.
  project: observational tests for inflationary cosmology (theme 1).

- Ivashko, A. as of 1 October 2011 with A. Boyarsky (A. Achúcarro, formal advisor).
  project: particle physics beyond the standard model, the early universe (theme 1).
- Schram, R. as of 1 October 2011 with H. Schiessel and G.T. Barkema.
  project: polymer simulation models for large scale chromatin organisation, identification of possible segregation mechanisms of the sister chromosomes after duplication (theme 2).

- Beuman, T.H. as of 1 December 2011 with V. Vitelli (M. van Hecke, formal advisor).
  project: the stochastic geometry of non-Gaussian fields (theme 2).

- Slager, R.-J. as of 1 January 2012 with J. Zaanen.
  project: research in the role of translational symmetry breaking in electronic topological order (theme 2).

- Diez, M. as of 1 February 2012 with C.W.J. Beenakker.
  project: study of topological phase transitions and superconductors in order to identify signatures in transport and thermodynamic properties of those transitions (theme 2).

- Liu, K. as of 1 September 2012 with J. Zaanen.
  project: gravity at a Kelvin: the collective modes of the superconducting quantum nematics (theme 2).

- Meszéna, B. as of 1 September 2012 with K. Schalm (J. Zaanen, formal advisor).
  project: applying the AdS/CFT correspondence to condensed matter systems (theme 1).

- Baireuther, P.S. as of 7 January 2013 with C.W.J. Beenakker and Y. Nazarov (TU Delft).
  project: transport properties of topological insulators and superconductors (theme 2).

- Tarasinski, B.M. as of 7 January 2013 with C.W.J. Beenakker.
  project: quantum transport properties of topological states of matter (theme 2).

- Almog, A. as of 14 January 2013 with D. Garlaschelli (J.M. van Ruitenbeek (UL), formal advisor).
  project: statistical physics of time series and financial networks (theme 2).

  project: theory and computer simulation of the motion of domain walls in small-scale magnetic materials, driven by either a current or by an external field (theme 2).
− Saravanan, S.K. as of 1 July 2013 with J.-W. van Holten.
   project: extreme mass ratio binaries (theme 2).

− Säterskog, P. as of 1 September 2013 with K. Schalm (A. Achúcarro,
   formal advisor).
   project: strongly coupled systems using holography and AdS/CFT (theme
   1).

− Sulangi, M. as of 1 September 2013 with J. Zaanen.
   project: to explore nano experiments on quantum matter (theme 2).

− Tompitak, M. as of 1 September 2013 with G.T. Barkema and H.
   Schiessel.
   project: sequence dependent plectoneme dynamics (theme 2).

− Babeanu, A.-I. as of 15 September 2013 with D. Garlaschelli (J. van
  Ruitenbeek (UL), formal advisor).
   project: statistical physics and social dynamics (theme 2).

− van Zuiden, B.C. as of 15 September 2013 with V. Vitelli (M. van Hecke
  (UL), formal advisor).
   project: theoretical investigations of melting on a curved space (theme 2).

− Marciani, M. as of 16 September 2013 with C.W.J. Beenakker and M.
  Wimmer (TUD).
   project: signatures of topological superconductivity in oxide interfaces
   (theme 2).

− Zhou, Y. as of 17 September 2013 with V. Vitelli (M. van Hecke (UL),
  formal advisor).
   project: topological soft matter and active matter (theme 2).

− Poovuttikul, N. as of 1 October 2013 with J. Zaanen.
   project: quantum matter versus the AdS/CFT correspondence (theme 2).

− Torrado Cacho, J. as of 1 October 2013 with A. Achúcarro.
   project: signatures of heavy physics in the primordial perturbations
   (theme 1)
   Note: transferred in 2013 from the PhD program at Technical University
   of Munich (TUM) for his last year of PhD and will graduate in Leiden.

− Gemmetto, V. as of 1 November 2013 with D. Garlaschelli (J. van
  Ruitenbeek (UL), formal advisor).
   project: multilevel complex networks (theme 2).
Radboud University Nijmegen (RU)
- van den Broek, T.C.H. as of 1 November 2009 with W.J.P. Beenakker and W.D. van Suijlekom (formal advisor, R.H.P. Kleiss).
  project: deriving the minimal supersymmetric standard model from noncommutative geometry (theme 1). PhD exam: 5 September 2014.

- Pires, L.P. as of 1 February 2012 with R. Loll.
  project: low energy/classical limits of Horava-Lifshitz gravity in its different versions. Connections between Horava-Lifshitz gravity (HLG) and causal dynamical triangulations (CDT) (theme 1).

- Ado, I. as of 1 December 2013 with M. Titov (M.I. Katsnelson, formal advisor).
  project: condensed matter theory with the emphasis on topological effects in nanostructures involving magnetic materials (theme 2).

Utrecht University (UU)
- Franzen, A.T. as of 1 June 2009 with G. 't Hooft.
  project: algebraical description of quantum effects of the horizon of black holes and related aspects of quantum field theories (theme 1).

- van der Bijl, E. as of 1 February 2010 with R.A. Duine (H.T.C. Stoof, formal advisor).
  project: theoretical research on manipulating magnetic materials, and, in particular, manipulating domain walls (theme 2).
  PhD exam: 28 January 2014.

- Troppenz, T. as of 7 September 2010 with R.H.H.G. van Roij (M. Dijkstra (UU), formal advisor).
  project: to study the thermodynamic and structural properties of (nano)rods in emulsion droplets exposed to external electric fields (theme 2).

- Sfondrini, A. as of 1 October 2010 with G.E. Arutyunov.
  project: development of the thermodynamic Bethe Ansatz approach for the superstring theory on the AdS5 x S5 space-time as a tool to determine the spectrum of primary operators in the maximally supersymmetric gauge theory (theme 1). PhD exam: 28 April 2014.

- Toldo, C. as of 1 October 2010 with S.J.G. Vandoren.
  project: study of black holes in anti de Sitter spacetimes, and its relation to the AdS/CFT correspondence. This includes the study of BPS bounds, extremal and non-extremal black hole solutions in N=2 gauged supergravity. Embeddings into string theory, and microscopic entropy counting for black holes in asymptotically anti de Sitter spacetimes (theme 1). PhD exam: 11 June 2014.
van der Schee, W. as of 1 October 2010 with G.E. Arutyunov (T. Peitzmann, formal advisor).
project: applications of the gauge-string correspondence to the problem of heavy ion collisions. It includes determination of relaxation times and the elliptic flow by using phenomenologically relevant models of gravity in five space-time dimensions (theme 1). PhD exam: 2 July 2014.

Glavan, D. as of 1 May 2011 with T. Prokopec (R. Loll, formal advisor).
project: to develop methods for evaluating the backreaction of quantum fluctuations of scalar and tensor fields in general expanding space times on the evolution of the Universe. He will investigate to what extend can the backreaction change the evolution of the Universe during an inflationary phase as well as in a late universe, thereby studying its relevance for dark energy (theme 1).

project: to study interactions between proteins in aqueous solution at such high concentrations that there is a lack of hydration water and the proteins partially denature (theme 2).

Di Liberto, M. as of 15 July 2011 with C. Morais Smith.
project: to study strongly interacting cold atoms out of equilibrium in optical lattices. In particular, the Floquet theory will be used to derive effective models out of the time-dependent ones. Quantum novel phases will be investigated, always keeping in mind their possible experimental realization (theme 2).

Armaitis, J. as of 1 September 2011 with R.A. Duine (H.T.C. Stoof, formal advisor).
project: many-body effects in cold-atom systems, especially spin transport in mixtures of bosonic atoms (theme 2).

Borsato, R. as of 1 September 2011 with G.E. Arutyunov.
project: research is concentrated on study strings propagating in integrable backgrounds, the latter include beta-deformations of the AdS5 x S5 space-time. The main goal is to construct a rigorous quantization scheme by using methods from the theory of exactly solvable models (theme 1).

Jacobs, V. as of 1 September 2011 with S.J.G. Vandoren (H.T.C. Stoof, formal advisor).
project: applications of the AdS/CFT correspondence to condensed matter systems at strong coupling. In particular, the study of black hole solutions with anisotropic Lifshitz scaling, and its connection to cold Fermi gasses at unitarity (theme 2).
- de Leeuw, A.-W. as of 1 September 2012 with R.A. Duine (H.T.C. Stoof, formal advisor). 
  project: collective phenomena in quantum-many body systems, in particular the out-of-equilibrium dynamics of photon Bose-Einstein condensates (theme 2).

- Everts, J. as of 1 September 2012 with R.H.H.G. van Roij. 
  project: electrostatics in oil (theme 2).

- Lamers, J. as of 1 September 2012 with G.E. Arutyunov. 
  project: to study a newly discovered relationship between vacua of N=2 supersymmetric gauge theories and integrable models (theme 1).

- Gaddam, N. as of 1 January 2013 with S.J.G. Vandoren. 
  project: a microscopic understanding of black holes in gauged N = 2 supergravity theories, including bulk realizations of related (0,4) SCFTs. A study of single center black hole entropies in N = 2 ungauged supergravity, topological invariants of related quiver gauge theories and corresponding counting problems in algebraic geometry. A preliminary interest in holographic realizations of fractional quantum Hall effect and confining geometries (theme 1).

- Buhrandt, S. as of 1 February 2013 with L. Fritz (H.T.C. Stoof, formal advisor). 
  project: properties of (frustrated) magnets and their unconventional excitations, including for instance analogues of magnetic monopoles (theme 2).

- Soligno, G. as of 1 February 2013 with R.H.H.G. van Roij. 
  project: effective electrostatic and capillary interactions at particle-laden aqueous interfaces (theme 2).

- Flebus, B. as of 1 April 2013 with R.A. Duine (H.T.C. Stoof, formal advisor). 
  project: definition of a two-fluid theory for spin superfluidity in magnetic insulators (theme 2).

- Janssen, M.A. as of 1 May 2013 with R.H.H.G. van Roij. 
  project: modeling the electrical double layer near the surface of nanoporous super capacitors, aiming at the optimization of capacitivemixing and water desalination processes (theme 2).

- Jain, S.K. as of 13 August 2013 with G.T. Barkema. 
  project: to develop an empirical potential and atomistic models of a solar cell and graphene (theme 2).
- Betzios, P. as of 1 September 2013 with U. Gürsoy (S.J.G. Vandoren, formal advisor).
  project: applications of gauge/gravity duality in strongly coupled systems (theme 1).

- Papadoulaki, O. as of 1 September 2013 with U. Gürsoy (S.J.G. Vandoren, formal advisor).
  project: exploration of QCD and condensed matter systems using gauge/gravity duality (theme 1).

- Quelle, A. as of 1 September 2013 with C. Morais Smith.
  project: various aspects of topological materials out of equilibrium, thermodynamics, non-trivial geometry, etc. (theme 2).

- Sybesma, Z.W. as of 1 September 2013 with S.J.G. Vandoren.
  project: on the Elucidation of the applications of AdS/CFT holography (theme 1).

- Bet, B. as of 1 October 2013 with R.H.H.G. van Roij.
  project: We study the individual and collective properties of active matter: particles on micrometer scale that transform energy into movement. In particular, we use numerical methods to describe the hydrodynamics of colloidal 'swimmers' (theme 2).

- Gergs, N.M. as of 1 October 2013 with D. Schuricht (C. Morais Smith, formal advisor).
  project: transport properties and out of equilibrium dynamics of low-dimensional strongly correlated quantum systems (theme 2).

**Nikhef Theory Group (Nikhef)**

- Knegjens, R.J. as of 1 February 2010 with R. Fleischer.
  project: B decays as probes of new physics (theme 1).

- Lodato, I. as of 1 October 2010 with B. de Wit.
  project: aspects of black holes and string theory as part of the ERC Advanced Grant project "Supersymmetry: a window to non-perturbative physics", led by B. de Wit (theme 1). PhD exam: 29 September 2014.

- De Bruyn, K.A.M. as of 1 June 2011 with R. Fleischer and D. Koppenburg (M.M. Merk, formal advisor).
  project: CP-violating phenomena in B-meson decays (theme 1).

- d'Ambrosi, G. as of 15 September 2011 with J.-W. van Holten and J.F.J. van den Brand (VUA).
  project: research on the emission of gravitational waves by binary systems consisting of a massive black hole and a second compact object (theme 1).
- Bonocore, D. as of 1 December 2011 with E. Laenen.
  project: QCD processes at the LHC; precision predictions via resummation and/or Monte Carlo. Development of new methods thereto (theme 1).

- Reys, V. as of 1 March 2012 with B. de Wit.
  project: study of BPS black hole entropy using localization, and possibly other applications (theme 1).

- Ciceri, F. as of 15 November 2012 with B. de Wit.
  project: study of higher-derivative couplings in supergravity with applications to black hole entropy and the question of finiteness (theme 1).

- Wiechers, M. as of 1 April 2013 with M. Postma (formal advisor, E.L.M.P. Laenen).
  project: to study models of dark matter and their phenomenological implications. The focus is on models that relate ordinary and dark matter and thus explain why their respective abundances are so similar (theme 1).

- Ruijl, B.J.G. as of 1 September 2013 with J. Vermaseren (formal advisor, S. Bentvelsen)
  project: using methods from artificial intelligence, we solve problems in high energy physics, particularly the computation of four-loop Feynman diagrams (theme 1).

- Volponi, M. as of 1 October 2013 with M. Postma (formal advisor, E.L.M.P. Laenen).
  project: quantum corrections during (Higgs) inflation (theme 1).
4.6 Scientific and educational activities of PhD students (theme 1)

Alkaç, G. (RUG)

Arvidsson Liem, S.L.S. (UvA)
− Amsterdam-Paris-Stockholm Workshop, Institut d'Astrophysique de Paris (IAP), France, 16-18 December 2013 (attended).

Atal, V. (UL)
− Effective field theory in inflation and the imprint of massive fields, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
− EFT in inflation: the imprint of heavy fields and the adiabaticity condition, Physics@FOM Veldhoven 2013, the Netherlands, 22-23 February 2013 (poster).
− Conference, Quantum Universe, Groningen, the Netherlands, 27-28 March 2013 (attended).
− Conference, Ibericos Granada, Spain, 24-26 April 2013 (attended).
− Effective field theory in inflation: the imprint of massive fields and the adiabaticity condition, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
− EFT during inflation, Les Houches School of Physics, Cosmology after Planck, Les Houches, France, 8-29 July 2013 (talk).

Basanisi, L. (RUG)
− Doctoral School, String Theory, General Relativity and Advanced Quantum Field Theory, Brussels, Belgium, October 2013 (attended).
− Solvay Chair, Lectures, Physics Beyond the Standard Model, Dr. Gian F. Giudice, October 2013 (attended).

Betzios, P. (UU)
− Holography and QCD, Workshop, Regensburg, Germany, July 2013 (attended).
− DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
− Brussels-Paris-Amsterdam Solvay School, ULB/VUB, Brussels, Belgium, 7-25 October 2013; ENS/LPTHE Paris, France, 4-22 November 2013; University of Amsterdam, the Netherlands, 2-20 December 2013 (attended).

Bonocore, D. (Nikhef)
− Next to eikonal resummation, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Driebergen, the Netherlands, 11-22 February 2013 (talk).
- *Toward the next-to-eikonal Drell-Yan*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

**Borghese, A. (RUG)**
- *The role of photons in supergravity*, QU3 Symposium, Groningen, the Netherlands, 27-28 March 2013 (talk).
- *A good year, the recent history of maximal supergravity*, Texas A&M University, USA, 23 September 2013-2 October 2013 (work visit; talk).

**Borsato, R. (UU)**
- DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (attended).
- National Seminar Theoretical High Energy Physics, Amsterdam, the Netherlands, 1 March 2013 (attended).
- Mathematica School Conformal Field Theories in Higher Dimensions and the Conformal Bootstrap, Trieste, Italy 11-16 March 2013 (attended).
- *Solving a theory exactly: AdS3 x S3 x T4*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- Workshop, Integrability in Gauge and String Theory, Utrecht, the Netherlands, 19-23 August 2013 (co-organizer, attended).
- City University, London, UK, 14-18 September 2013 (work visit).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- *AdS3/CFT2 and integrability*, Strings, Cosmology and Gravity Student Conference 2013, 7-9 November 2013, Munich, Germany (talk).
- National Seminar Theoretical High Energy Physics, Amsterdam, the Netherlands, 22 November 2013 (attended).

**Buffing, M.G.A. (VUA)**
- Physics@FOM Veldhoven 2013, the Netherlands, 21-23 January 2013 (member of poster committee).
- *Using color to zoom in on quarks and gluons in a proton*, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- National Seminar Theoretical High Energy Physics, Amsterdam, the Netherlands, 1 March 2013 (attended).
- Topical Lectures, Accelerators, Nikhef, Amsterdam, the Netherlands, 20-22 March 2013 (attended).
- *Universality of TMD distribution functions*, DIS 2013, Marseille, France, 22-26 April 2013 (talk).
- *Universality of gluon TMD distribution functions*, QCD Evolution Workshop, Jefferson Lab, Newport News, USA, 6-10 May 2013 (talk).
- *pGluons in high-energy scattering processes, playing with color*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
Topical Lectures, Dark Matter, Nikhef, Amsterdam, the Netherlands, 10-12 June 2013 (attended).

DRSTP PhD Day 2013, Utrecht, the Netherlands, 27 September 2013 (attended).

Workshop, Noncommutative Geometry and Particle Physics, Leiden, the Netherlands, 15 October 2013 (attended).

Transverse momentum dependent processes in particle physics, Student Meeting, Nikhef Theory Meeting, Amsterdam, the Netherlands, 25 October 2013 (attended).

How to observe color in hadronic interactions if you are color-blind, NNV Najaarsvergadering, Lunteren, the Netherlands, 1 November 2013 (talk).

National Seminar Theoretical High Energy Physics, Amsterdam, the Netherlands, 22 November 2013 (attended).

Nikhef Jamboree 2013, Nikhef Annual Meeting, Amsterdam, the Netherlands, 16-17 December 2013 (attended).

Caldeira Costa, R. (UvA)

Generalised gravitational entropy, Conference, University of Southampton, UK, May 2013 (talk).

Summer School, Asia Pacific Center for Theoretical Physics, Pohang University for Science, Pohang, South Korea, 13-22 June 2013 (attended).

Research as visiting PhD student, University of Southampton, School of Mathematical Sciences, UK, 1 September 2012-31 January 2014 (work visit).

Ciceri, F. (Nikhef)

Towards a N=4 conformal supergravity action, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).

Towards N=4 conformal supergravity actions, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).

DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

Cohen, D. (UvA)

DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

d’Ambrosi, G. (Nikhef)

Gravitational waves? Yes. neutron stars? May be.., DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).

Beyond ISCO orbits for EMRIs, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).

A song of waves and stars, DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (talk; co-organizer).

De Bruyn, K.A.M. (Nikhef)

Hunting penguins with B_0 → J/ψ K_0, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).

CERN, Geneva, Switzerland, 15 April 2012-15 March 2013 (work visit).
de Haan, S. (RUG)
- Third Quantum Universe Symposium, Groningen, the Netherlands, 27-28 March 2013 (attended).
- Seventh Aegean Summer School, Beyond Einstein’s Theory of Gravity, Parikia, Greece, 23-28 September 2013 (attended).
- FOM Young Scientists Day, Amsterdam, the Netherlands, 12 December 2013 (attended).

Dekens, W.G. (RUG)
- Running dimension-six CP-violating operators to low energies, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- Running new sources of CP violation down to hadronic scales, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- CP violation from high to low energies, DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (talk).

de Lange, P. (UvA)
- Quantum moduli space of quiver gauge theories, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).

Franzen, A.T. (UU)
- Princeton University, Mathematics Department, New Jersey, USA, March 2013 (work visit).
- Cambridge University, Department of Pure Mathematics, UK, under supervision of Prof. Mihalis Dafermos, February 2012-April 2013 (work visit, internship).
- Kerr Conference, Potsdam, Germany, 4-5 July 2013 (attended).
- ETH, Mathematics Department, Zurich, Switzerland, October-December 2013 (work visit).
- The Geometry and Analysis of Black Holes in General Relativity, Nachdiplom Series, by Mihalis Dafermos, ETH, Zurich, Switzerland, October-December 2013 (attended).

Gaddam, N. (UU)
- Interpreting microscopic degrees of freedom of black holes, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- Dr. Jan Manschot, University of Bonn, Germany, 10-12 March 2013 (work visit).
- Black holes corresponding to the MSW CFT, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- Conference, A Singular Life, in honor of Eduard Looijenga, Utrecht University, the Netherlands, 27-28 June 2013 (attended).
- Conference, Special Functions and Special Numbers, Utrecht University, 10-12 July 2013 (attended).
- Summer School, Moduli Spaces in Algebraic Geometry and Physics, University of Hamburg, Germany, 12-16 August 2013 (attended).
- Conference, IGST 2013, Utrecht University, the Netherlands, 19-23 August 2013 (attended).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- Brussels-Paris-Amsterdam Solvay School, ULB/VUB, Brussels, Belgium, 7-25 October 2013; ENS/LPTHE Paris, France, 4-22 November 2013; University of Amsterdam, the Netherlands, 2-20 December 2013 (attended).

**Galante, M. (RUG)**
- Brussels - Paris - Amsterdam School, Quantum Field Theory, Strings and Gravitation, October - November 2013 (attended).

**Glavan, D. (UU)**
- *Quantum backreaction in cosmology*, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- *Quantum backreaction in cosmology*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- Workshop, New Challenges for Early Universe Cosmologists, 5-9 August 2013, Leiden, the Netherlands (attended).

**Goykhman, M. (UL)**
- *Holographic renormalization of the tachyon-DBI models*, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).

**Ilgin, I. (UvA)**
- *Complementarity vs firewall*, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- *Probing black hole horizons*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

**Ivashko, A. (UL)**
- *Large-scale magnetic fields in the Universe*, Physics@FOM Veldhoven 2013, the Netherlands, 22-23 January 2013 (poster).
- *Magnetic fields and chiral anomaly: from the early Universe to the LHC*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- Magnetic fields and chiral anomaly: from the early Universe to the LHC, 17th Symposium on Astroparticle Physics, Nijmegen, the Netherlands, 30 May 2013 (talk).

Kabir, L. (UvA)
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

Knegjens, R. (Nikhef)
- In pursuit of new physics with B_s mesons, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).

Kovačevič, M. (RUG)
- New massive gravity, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- Quantum Universe, Groningen, the Netherlands, 27-28 March 2013 (attended).
- Massive gravity I and Massive gravity II, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (two posters, together with Lorena Parra, Thomas Zojer, Sjoerd de Haan and Yihao Yin) (poster).
- FOM String Meeting, Utrecht, the Netherlands, 14-15 June 2013 (attended).
- 3D supersymmetric new massive gravity with auxiliary fields, Supersymmetries and Quantum Symmetries (SQS) 2013, Dubna, Russia, 29 July-3 August 2013 (talk).
- School, Supersymmetry and Unification of Fundamental Interactions (Pre-SUSY 2013), ICTP, Trieste, Italy, 20-23 August 2013 (attended).
- PhD Day, Groningen, the Netherlands, 26 August 2013 (attended).
- Beyond Einstein’s Theory of Gravity, Paros, Greece, 23-28 September 2013 (attended).
- 3D supersymmetric new massive gravity with auxiliary fields, 29th Nordic Network Meeting, Strings, Fields and Brane, Stockholm, Sweden, 7-9 November 2013 (talk).

Lamers, J. (UU)
- The Bethe/gauge correspondence, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- National Seminar Theoretical High Energy Physics, Amsterdam, the Netherlands, 1 March 2013 (attended).
- The Bethe/gauge correspondence, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- Summer School, Moduli Spaces in Algebraic Geometry and Physics, University of Hamburg, Germany, 12-16 August 2013 (attended).
- Workshop, Integrability in Gauge and String Theory, Utrecht University, the Netherlands, 19-23 August 2013 (attended).
- Modave Summer School, Mathematical Physics, Modave, Belgium, 2-6 September 2013 (attended).
- Workshop, Geometric Correspondences of Gauge Theories, ICTP, Trieste, Italy, 9-13 September 2013 (attended).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- National Seminar Theoretical High Energy Physics, Amsterdam, the Netherlands, 22 November 2013 (attended).

**Lodato, I. (Nikhef)**
- *Flat directions in 5D supergravity*, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- *Gauss-Bonnet invariant in 4D N=2 supergravity*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).

**Mayerson, D.R. (UvA)**
- *Black holes and CFTs*, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- ICTP Superstrings School, ICTP, Trieste, Italy, 18-26 March 2013 (attended).
- *Classifying supersymmetric black holes in 3D maximal SUGRA*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- APCTP Focus Program, Holography 2013, POSTECH, Pohang, South Korea, 11-21 June 2013 (attended).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- Strings, Cosmology, and Gravity, Student Conference 2013, Classifying Supersymmetric Black Holes in 3D Maximal Supergravity, Munich, Germany, 7-9 November 2013 (attended).

**Merbis, W. (RUG)**
- Physics@FOM Veldhoven 2013, the Netherlands, 22-23 January 2013 (attended).
- GGI Workshop, Higher-Spins, Strings and Duality, Florence, Italy, March/April 2013 (attended).
- *Massive gravity in three dimensions*, FOM String Meeting, Utrecht, the Netherlands, 14 June 2013 (talk).
- Seventh Aegean Summer School, Beyond Einstein’s Theory of Gravity, Parikia, Island of Paros, Greece, September 2013 (attended).
- *Holography with two dreibeine*, Seventh Aegean Summer School, Paros, Greece, 27 September 2013 (talk).
- Strings, Cosmology and Gravity Student Conference 2013, Munich, Germany, 7-9 November 2013 (attended).
- **Bulk and boundary unitarity in 3D massive gravity**, Strings, Cosmology and Gravity Student Conference 2013, Munich, Germany, 9 November 2013 (talk).
- **Bulk and boundary unitarity in 3D massive gravity**, ULB/KU Leuven Joint Seminar, Brussels, Belgium, 13 November 2013 (talk).
- **Bulk and boundary unitarity in 3D massive gravity**, TU-Wien, Vienna, Austria, 21 November 2013 (talk).

**Meszéna, B. (UL)**
- Condensed matter applications of AdS/CFT, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
- **Non-perturbative quantum field theory**, Erasmus IP School, University of Crete, Heraklion, Greece, 1-28 April 2013 (talk).
- **Holographic BCS theory, part I**, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- **Gauge-gravity duality and condensed matter physics**, Arnold Sommerfeld School, LMU, Munich, Germany, 5-9 August 2013 (talk).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

**Mooij, S. (Nikhef)**
- Gauge field production during inflation: non-Gaussianity and primordial black holes, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).

**Mosk, B. (UvA)**
- **Causal holographic information**, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- **Causal holographic information**, National Dutch String Meeting, Utrecht, the Netherlands, 14-15 June 2013 (talk).

**Noordmans, J. (RUG)**
- **Nuclear beta decay with Lorentz violation**, Physics@FOM Veldhoven 2013, 22-23 January 2013, the Netherlands (talk).
- Third Quantum Universe Symposium (QU3), Groningen, the Netherlands, 27-27 March 2013 (attended).
- **Nuclear beta decay with Lorentz violation**, Symposium, Broken Mirrors & Drifting Constants, Amsterdam, the Netherlands, 7 May 2013 (talk).
- **Testing Lorentz symmetry in weak decay**, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- **Nuclear beta decay with Lorentz violation**, CPT’13, Indiana, USA, 17-21 June 2013 (attended).
- NNV Najaarsvergadering. Lunteren, the Netherlands, 1 November 2013 (attended).

**Nunes da Silva, T. (RUG)**
- Unraveling the conformal window on the lattice, Physics@FOM Veldhoven 2013, 22-23 January 2013, the Netherlands (talk).
- Istituto Nazionale di Fisica Nucleare, Frascati, Italy, Collaboration Meeting, 13-22 March 2013 (work visit).
- Approaching confromality, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- STRONGnet Fellows' Workshop, Regensburg, Germany, 24-27 June 2013 (attended).
- More results on theories inside the conformal window, The 31st International Symposium on Lattice Field Theory, 29 July-3 August 2013, Mainz, Germany (talk).
- Probing the conformal window on the lattice, XQCD 2013 - Workshop, QCD under Extreme Conditions, Bern, Switzerland, 5-7 August (talk).
- FOM Young Scientists' Day, Amsterdam, the Netherlands, 12 December 2013 (attended).

Ortiz, P. (UL)
- Transient reduction of the inflaton speed of sound in the CMB, UK Cosmo, King's College, London, UK, 20 January 2014 (talk).
- Transient reduction of the inflaton speed of sound in the Planck data, Physics@FOM Veldhoven 2013, the Netherlands, 21-22 January 2014 (poster).
- Sgoldstino inflation, Physics@FOM Veldhoven 2013, the Netherlands, 22-23 January 2013 (talk).
- Sgoldstino inflation, Iberian Cosmology Meeting, Granada, Spain, 23-28 April 2013 (talk).
- Features in the CMB from heavy physics during inflation, DRSTP Symposium Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- Testing inflation with the CMB, Student Seminar, Theory Center Meeting and Theoretical Cosmology Meeting, Nikhef, Amsterdam, the Netherlands, 28 June 2013 (talk).
- Advanced DPG School, Inflation and CMB, Bad Honnef, Germany, 7-12 July 2013 (attended).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- Localized features in the CMB spectra due to a transient reduction in the speed of sound, Seminar, Theoretical Cosmology Meeting, Nikhef, Amsterdam, the Netherlands, 4 October 2013 (talk).
- Localized features in the CMB spectra due to a transient reduction in the speed of sound, II Postgraduate Meeting, Theoretical Physics, Institute for Theoretical Physics (IFT), Madrid, Spain, 10 October 2013 (talk).
- Localized features in the CMB spectra due to a transient reduction in the speed of sound, Seminar, Cosmological and Holographic Applications of Supergravity Symposium, Groningen, the Netherlands, 18 October 2013 (talk).
- School on Cosmology Tools, Institute for Theoretical Physics (IFT), Madrid, Spain, 12-15 November 2013 (attended).
Search for a transient reduction of the inflaton speed of sound in the CMB, Journal Club Cosmology, Instituut-Lorentz, Leiden University, the Netherlands, 4 December 2013 (talk).

Search for a transient reduction of the inflaton speed of sound in the CMB, Seminar, Theoretical Physics Department Seminar, University of the Basque Country, Bilbao, Spain, 17 December 2013 (talk).

Papadoulaki, O. (UU)
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

Parra Rodriguez, L. (RUG)
- A String Theoretic Approach to Cosmology and Quantum Matter, Utrecht, the Netherlands, 14-15 June 2013 (attended).
- Introductory Event for PhD Students, Groningen, the Netherlands, 20-21 June 2013 (attended).
- Kaluza Klein reductions for supersymmetric Fierz-Pauli, International Workshop, Supersymmetries and Symmetries - SQS'2013, Dubna, Russia, 29 July-3 August 2013 (talk).
- Dr. David Vergara, Instituto de Ciencias Nucleares (Nuclear Sciences Institute), UNAM, Mexico City, Mexico, 5-20 August 2013 (work visit).
- PhD Day, Groningen, the Netherlands, 26 August 2013 (attended).
- Seventh Aegean Summer School, Beyond Einstein's Theory of Gravity, Paros, Greece, 23-28 September 2013 (attended).
- DRSTP PhD Day, Utrecht, the Netherlands, 12 October 2012 (attended).
- Kaluza Klein reductions for supersymmetric Fierz-Pauli, 29th Nordic Network Meeting, Strings, Fields, Branes, Stockholm, Sweden, 7-9 November 2013 (talk).

Pinzani Fokeeva, N. (UvA)
- FOM@Veldhoven 2013, the Netherlands, 22-23 January 2013 (attended).
- Towards a general fluid/gravity correspondence, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- ICTP Superstrings School, ICTP, Trieste, Italy, 18-26 March 2013 (attended).
- The world as a hologram, PhD Symposium, Amsterdam, the Netherlands, May 2013 (talk).
- Towards general fluid/gravity correspondence, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- APCTP Focus Program, Holography 2013, POSTECH, Pohang, South Korea, 11-21 June 2013 (attended).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended; co-organizer).
- Towards a general fluid-gravity correspondence, Postgraduate Meeting, Theoretical Physics (IFT), Madrid, Spain, 9-11 October 2013 (talk).
Pires, L. (RU)
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended; co-organizer).

Reys, V. (Nikhef)
- *The kinetic multiplet in N=2, d=4 supergravity*, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- *The kinetic multiplet and localizing solutions in supergravity*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

Rietkerk, R.J. (UvA)
- C++ Course, Nikhef, Amsterdam, the Netherlands, 4-16 January 2013 (attended).
- *Spin correlations with Higgs bosons*, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- CERN, Geneva, Switzerland, 24 April-3 May 2013 (work visit).
- *Spin correlations with Higgs Bosons*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- *Spin correlations with Higgs bosons*, IoP Symposium, University of Amsterdam, the Netherlands, 23 May 2013 (poster).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- School of Analytic Computing in Theoretical High-Energy Physics, LHCPenoNet, Atrani, Italy, 30 September-5 October 2013 (attended).
- LHCPenoNet Annual Meeting (CERN), Geneva, Switzerland, 2-5 December 2013 (visit).
- ERC Miniworkshop, Cern, Geneva, Switzerland, 5-6 December 2013 (attended).

Saravanan, S.K. (UL)
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

Scalisi, M. (RUG)
- Nordic String Meeting 2013, DESY, Hamburg, Germany, February 2013 (attended).
- QU3 - Third Quantum Universe Symposium, University of Groningen, the Netherlands, March 2013 (attended).
- Quantum Gravity and Fundamental Cosmology, Workshop, AEI, Potsdam, Germany, March 2013 (attended).
- 8th International Kosmologietag, Workshop, IBZ, Bielefeld University, Germany, April 2013 (attended).
− Inflation in supergravity, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
− Advanced DGP Physics School, Inflation and CMB, Physikzentrum, Bad Honnef, Germany, July 2013 (attended).
− School and Workshop, New Light in Cosmology from the CMB at ICTP, Trieste, Italy, July-August 2013 (attended).
− Kähler potentials for Planck inflation, II Postgraduate Meeting on Theoretical Physics, IFT UAM/CSIC, Madrid, Spain, October 2013 (talk).
− Planck inflation in supergravity, String, Cosmology and Gravity, Student Conference 2013, Max Planck Institute for Physics, Munich, Germany, November 2013 (talk).
− Cosmology for String Theorists, Lectures given by Dr. Daniel Baumann, within the Amsterdam-Brussels-Paris Doctoral School 2013 at IoP, University of Amsterdam, the Netherlands, December 2013 (attended).

Sfondrini, A. (UU)
− Integrability in AdS3/CFT2, Iberian Strings, Lisbon, Portugal, 13 January 2013 (talk).
− The AdS3/CFT2 S matrices, University of Surrey, UK, February 2013 (talk; work visit).
− The pleasure of working out things, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (awarded best poster).
− Workshop, Integrability in Gauge and String Theory, Utrecht University, the Netherlands, 19-23 August 2013 (attended).
− Worldsheet integrability in AdS/CFT, SISSA, Trieste, Italy, September 2013 (talk).
− London City University, UK, October 2013 (work visit).
− Worldsheet integrability in AdS/CFT, University of Padova, Italy, October 2013 (talk).
− Ecole Polytechnique Paris and Orsay University, France, November 2013 (work visit).
− D-ITP Course, Introduction to Universality and Functional Renormalization Techniques, Utrecht University, the Netherlands, November 2013 (attended).
− Integrability in AdS/CFT, IX Avogadro Meeting Trieste, Italy (with A. Torrielli), December 2013 (talk).

Signori, A. (VUA)
− TMDs: a transverse look into hadrons, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
− Exploring the flavor dependence of unpolarized TMDs, Theoretical Physics Scientific QCD Evolution Workshop, Thomas Jefferson National Accelerator Facility, Newport News, VA, USA, 6 May 2013 (talk).
− Transverse motion of quarks: what's its flavor, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
What is the probability of finding an electron inside an electron?, Student Seminar, Nikhef, Amsterdam, the Netherlands, 31 May 2013 (talk).

Exploring the flavor dependence of unpolarized TMDs, Theoretical Physics scientific Structure of Nucleons and Nuclei Workshop, Como, Italy, 11 June 2013 (talk).

DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended; co-organizer).

Does the transverse motion of quarks depend on their flavor?, Theoretical Physics scientific NNV Fall Meeting, Lunteren, the Netherlands, 1 November 2013 (talk).

Flavor dependence of unpolarized fragmentation functions, Theoretical Physics scientific Indiana-Illinois Workshop on Fragmentation Functions, Bloomington, USA, 13 December 2013 (talk).

From quarks to TMDs: a transverse look into hadrons, Theoretical Physics scientific, Pavia, Italy, 19 December 2013 (talk).

Silverwood, H. (UvA)

Dark matter composition and detection, complementarity of XENON1T and IceCube for the reconstruction of dark matter properties, International School for AstroParticle Physics (ISAPP) 2013, Djurönäset, Sweden, 29 July-6 August 2013 (poster).

GAIA Challenge Workshop, University of Surrey, Guildford, UK, 19-23 August 2013 (attended).

DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

Toldo, C. (UU)

Superstring Theory and Related Topics, Spring School, ICTP, Trieste, Italy, March 2013 (attended).

Phase transitions of AdS black holes, Planet Talk, Institute for Theoretical Physics, Utrecht University, the Netherlands, April 2013 (talk).

Phase transitions of AdS black holes, Seminar, Milano-Bicocca, Italy, May 2013 (talk; work visit).

Phase transitions of AdS4 black holes, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).

Phase transitions of hairy magnetic AdS black holes, Conference, String Theory Universe, Bern, Germany, September 2013 (talk).

Phase transitions of AdS4 black holes, DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (talk).

Anti de Sitter black holes from gauged supergravity, Informal Seminar, Leuven, Belgium, November 2013 (talk).

Anti de Sitter black holes from gauged supergravity, Seminar, Jussieu, Paris, France, November 2013 (talk; work visit).

Anti de Sitter black holes from gauged supergravity, Seminar, Saclay, France, November 2013 (talk).
Torrado Cacho, J. (UL)
- Can we observe turns in the (effectively-single-field) inflationary trajectory?, Ibericos 2013, VIIIth Iberian Cosmology Meeting, Granada, Spain, 24-26 April 2013 (talk).
- DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (attended).
- Localized features in the CMB spectra due to a transient reduction in the speed of sound -- part II, II Postgraduate Meeting in Theoretical Physics, Instituto de Fisica Teorica, Madrid, Spain, 9-11 October 2013 (talk).
- Localized features in the CMB spectra due to a transient reduction in the speed of sound, 18th Symposium on Astroparticle Physics in the Netherlands, Leiden Institute of Physics, the Netherlands, 23 October 2013 (talk).
- Search for localized features in Planck's CMB spectra due to a transient reduction in the speed of sound, research visit to Dr. Julien Lesgourgues at Seminar at Ecole Polytechnique Federale de Lausanne (EPFL), Lausanne, Switzerland, 28 October-1 November 2013 (talk, work visit).
- Search for localized features in Planck's CMB spectra due to a transient reduction in the speed of sound, research visit to prof. Alejandro Ibarra, Seminar, Technical University Munchen, Germany, 29 November 2013 (talk, work visit).

van den Broek, T. (RU)
- Going beyond the Standard Model with noncummutative geometry, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- Noncommutative Geometry and Particle Physics, Lorentz Center Leiden, 14-18 October 2013 (attended).

van der Schee, W. (UU)
- University of Barcelona, Spain, one week in February 2013 (work visit).
- Holographic thermalisation with radial flow, Seminar, Leiden University, the Netherlands, 7 February 2013 (talk).
- Holographic thermalisation with radial flow, Seminar, Stony Brook University, New York, USA, 1 March 2013 (talk).
- Holographic thermalisation with radial flow, Seminar, Columbia University, New York, USA, 4 March 2013 (talk).
- Holographic thermalisation with radial flow, Seminar, University of Colorado, Boulder, USA, 18 March 2013 (talk; 2 weeks work visit).
- From full stopping to transparency-towards more realistic holographic models of heavy-ion collisions, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- Quarks gluonen en zwarte gaten, Nederlands Tijdschrift voor Natuurkunde 79, 112-114 (May 2013) (article).
- Thermalization, School, Bangalore, India, two weeks in June 2013 (attended).
- Gravity in Higher Dimensions, Workshop, Benasque, Spain, two weeks in July 2013 (attended).
- *From full stopping to transparency*, String Theory, Black Holes and Holography, Kyoto, Japan, 1-5 July 2013 (poster).
- *From full stopping to transparency*, Conference, Gauge/Gravity Duality, Munich, Germany, 30 July 2013 (poster).
- *From full stopping to transparency in a holographic model of heavy ion collisions*, Conference, Initial Stages in High-Energy Nuclear Collisions, Spain, September 2013 (talk).
- *From full stopping to transparency in a holographic model of heavy ion collisions*, Conference, Holography: From Gravity to Quantum Matter and QCD - Recent Progress and Challenges, Japan, September 2013 (talk).
- Collisions in AdS and holographic thermalisation, Seminar, CERN, Geneva, Switzerland, 8 October 2013 (talk).
- Collisions in AdS and holographic thermalisation, Seminar, VUB, Brussels, Belgium, 16 October 2013 (talk).
- Collisions in AdS and holographic thermalisation, Seminar, Cambridge University, UK, 24 October 2013 (talk).
- Collisions in AdS and holographic thermalisation, Seminar, MIT, Massachusetts, USA, 18 November 2013 (talk; 1 week work visit).
- Collisions in AdS and holographic thermalisation, Seminar, Perimeter, Ontario, Canada, 28 November 2013 (video; 2 months work visit).
- Collisions in AdS and holographic thermalisation, Seminar, KITP, Santa Barbara, California, USA, 5 December 2013 (talk).
- Collisions in AdS and holographic thermalisation, Seminar, Caltech, California, USA, 6 December 2013 (talk).

**van Tongeren, S. (UU)**

**Volponi, M. (Nikhef)**
- *To SCET or not to SCET?*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).

**Vos, K.K. (RUG)**
- Physics@FOM Veldhoven 2013, 22-23 January 2013, the Netherlands (attended).
- Lorentz violation in weak decays, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
- Third Quantum Universe Symposium (QU3), Groningen, the Netherlands, 27-27 March 2013 (attended).
- Symposium, Broken Mirrors & Drifting Constants, Amsterdam, the Netherlands, 7 May 2013 (attended).
− *Limits on Lorentz violation in neutral-kaon decay*, CPT’13, Indiana, USA, 17-21 June 2013 (attended).
− Corfu Summer School and Workshop, Standard Model and Beyond, Greece, 30 August-11 September 2013.
− DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
− *Lorentz violation in weak decays*, NNV Najaarsvergadering, Lunteren, the Netherlands, 1 November 2013 (attended).

**Weenink, J.G. (UU)**
− *Frame independent cosmological perturbations*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
− DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

**Wiechers, M. (Nikhef)**
− *Asymmetric dark matter*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
− DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

**Yin, Y. (RUG)**
− 2nd Solvay Workshop, Higher Spin Gauge Theories, Brussels, Belgium, 5-8 February 2013 (attended).

**Zojer, T. (RUG)**
− *3D higher-derivative gravity*, Vienna, Austria, 1-18 January 2013 (talk).
− *Chiral gravity in three dimensions*, DRSTP Postgraduate Course, Theoretical High Energy Physics (THEP), Doorn, the Netherlands, 11-22 February 2013 (talk).
− Quantum Universe, Groningen, the Netherlands, 27-28 March 2013 (attended).
− *Massive gravity I+II*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
− Modave Summer School, Modave, Belgium, 1-7 September 2013 (attended).
− *Toward a non-relativistic, 3D, super-particle*, 7th Aegean Summer School, Parikia, Paros, Greece, 23-28 September 2013 (talk).
− *Toward a non-relativistic, 3D, super-particle*, 29th Nordic Network Meeting, Stockholm, Sweden, 7-9 November 2013 (talk).
4.7 Scientific and educational activities of PhD students (theme 2)

Almog, A. (UL)
- Maximum entropy matrices: binary vs weighted properties of real financial time series, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
- Maximum entropy matrices: binary vs weighted properties of real financial time series, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- Workshop, Econophysics and Networks Across Scales, Leiden University, the Netherlands, 27-31 May 2013 (attended).
- Time series research, Workshop, Econophysics and Networks across Scales, Leiden University, the Netherlands, June 2013 (talk).
- Netsci International School and Conference on Network Science, Copenhagen, Denmark, 3-7 June 2013 (attended).

Armaitas, J. (UU)
- Magnetization relaxation and geometric forces in a Bose ferromagnet, Physics@FOM Veldhoven 2013, the Netherlands, 22-23 January 2013 (poster).
- Topological Hall effect in spinor Bose gas, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
- Magnetization relaxation and geometric forces in a Bose ferromagnet, Conference, NewSpin3, Mainz, Germany, 2-9 April 2013 (poster).
- Magnetization relaxation and geometric forces in a Bose ferromagnet, Workshop, Ultracold Atoms and Gauge Theories, Trieste, Italy, 13-17 May 2013 (poster).
- Magnetization relaxation and geometric forces in a Bose ferromagnet, Conference, BEC2013, Costa Brava, Spain, 7-13 September 2013 (poster).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

Baarsma, J. (UU)
- Inhomogeneous superfluid phases in resonantly interacting Li6-K40 mixtures, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).

Babeanu, A. (UL)
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

Bagrov, A. (UL)
- Workshop, Non-Perturbative Quantum Field Theory, Heraklion, Crete, Greece, 1-28 April 2013 (attended).
- Holographic BCS theory, part II, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
− Workshop, Superconductivity - Theory, Experiments, and Phenomena, Cargese, Corsica, France, 5-17 August 2013 (attended).
− Colloquium, Hidden Order, Superconductivity, and Magnetism in URu2Si2, Leiden, the Netherlands, 4-8 November 2013 (attended).

**Baireuther, P.S. (UL)**

**Beuman, T.H. (UL)**
− *The stochastic geometry of non-Gaussian fields*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
− *The stochastic geometry of non-Gaussian fields*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).

**Bjerngaard, M. (UvA)**
− DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (attended).
− DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

**Brockmann, M. (UvA)**
− DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (attended).

**Čubrović, M. (UL)**
− *Toward the phase diagram of holographic fermions*, Department of Physics, University of Cologne, Germany, 22 March 2013 (talk).
− *Holographic fermi- and non-fermi liquids*, Department of Physics, Technical University Dresden, Germany, 19 April 2013 (talk).

**Dahlhaus, J.P. (UL)**
− *Fermion-parity anomaly of the critical supercurrent in the quantum spin-Hall effect*, Spring Meeting, German Physical Society (DPG), Regensburg, Germany, 15 March 2013 (talk).
− *Topological kicked rotators*, Spring Meeting, German Physical Society (DPG), Regensburg, Germany, 15 March 2013 (talk).
de Leeuw, A.-W. (UU)
- National Seminar Condensed Matter Physics, Amsterdam, the Netherlands, 11 January 2013 (attended).
- Physics@FOM Veldhoven 2013, the Netherlands, 22-23 January 2013 (attended).
- *Bose-Einstein condensation of photons*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
- Conference, NewSpin3, Mainz, Germany, 2-9 April 2013 (attended).
- *Non-equilibrium theory for Bose-Einstein condensation of photons*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- University of Bonn, Utrecht, the Netherlands, 22-23 October 2013 (work visit).

De Nardis, J. (UvA)
- *A critical metastable state*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
- Workshop, Quantum Many Body Systems out of Equilibrium, MPI Dresden, Germany, 19-30 Augustus 2013 (attended).
- Workshop, Correlation Functions of Quantum Integrable Models, University of Burgundy, Institut de Math'ematiques de Bourgogne, Dijon, France, 7-9 September 2013 (attended).
- *A journey into thermalization in a closed quantum system: from von Neumann to nowadays*, DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (talk).

Diez, M. (UL)
- 44th IFF Spring School, Quantum Information Processing, Jülich, Germany, 25 February-8 March 2013 (attended).

Di Liberto, M. (UU)
- *Eta-pairing superconductivity in optical lattices*, Physics@FOM Veldhoven 2013, the Netherlands, 22-23 January 2013 (poster).
- *Eta-pairing superconductivity in optical lattices*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- *Cold atoms in optical lattices*, Student Seminar, Nikhef, Amsterdam, the Netherlands, 29 November 2013 (talk).

**Eliëns, S. (UvA)**
- DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (attended).
- *Beyond the Luttinger liquid*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- School, Exact and Numerical Models of Low-Dimensional Quantum Structures, ITAP (Institute of Theoretical and Applied Physics), Marmaris, Turkey, 4-12 August 2013 (attended).

**Everts, J. (UU)**
- *Topological phase transitions drive by next-nearest-neighbor hopping*, Physics@FOM Veldhoven 2013, the Netherlands, 22-23 January 2013 (poster).
- *Investigating the importance of charge regulation in charged colloidal systems*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- 15th Dutch Soft Matter Meeting, Delft, the Netherlands, 8 November 2013 (attended).

**Flebus, B. (UU)**
- NewSpin3 Conference, Mainz, Germany, 2-4 April 2013 (attended).
- NewSpin3 Summer School, Mainz, Germany, 5-9 April 2013 (attended).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

**Fokkema, T.B. (UvA)**
- *Counterpropagating one-dimensional Bose fluids*, FOM@Veldhoven 2013, Veldhoven, the Netherlands, 22-23 January 2013 (poster).
- *Counterpropagating one-dimensional Bose fluids*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk, co-organizer).
- Counterpropagating one-dimensional Bose fluids, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- Physics in one dimension, IoP-PhD-PD-Symposium Amsterdam, the Netherlands, 23 May 2013 (talk).
- Workshop, Low-D Quantum Condensed Matter 2013, Amsterdam, the Netherlands, 8-12 July 2013 (attended).
- School, Exact and Numerical Models of Low-Dimensional Quantum Structures, ITAP (Institute of Theoretical and Applied Physics), Marmaris, Turkey, 4-12 August 2013 (attended).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- Critical states in the one-dimensional repulsive Bose gas, BEC meeting, Utrecht University, the Netherlands, 6 December 2013 (talk).

Fulga, I.C. (UL)
- Topological insulators, Majorana fermions and quantum computation, DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (talk).
- Theory and experiment and Majoranas, This Week's Discoveries, Leiden, the Netherlands, 17 December 2013 (talk).

Gergs, N.M. (UU)
- Energy current cotunnelling features for the Anderson quantum dot, Conference, Quantum Thermoelectrics: Dynamics, Fluctuations and Nonlinearities, Institute for Theoretical Physics, Aachen University, Germany, 24-27 November 2013 (poster).

Goykhman, M. (UL)
- Fluctuations in finite-density holographic quantum liquids, Physics@FOM Veldhoven, the Netherlands, 12-22 January 2013 (talk).
- Stringy holography at finite charge density, Strings 2013, Seoul, South Korea, 24-29 June 2013 (talk).
- Stringy holography at finite charge density, Supersymmetries and Quantum Symmetries (SQS), Dubna, Moscow Region, Russia, 29 July-3 August 2013 (talk).
- Postgraduate Meeting, Theoretical Physics, Madrid, Spain, 9-11 October 2013 (attended).

Haaker, S.M. (UvA)
- Physics@FOM Veldhoven, the Netherlands, 22-23 January 2013 (attended).
- Workshop, Ultracold Atoms and Gauge Theories, ICTP, Trieste, Italy, 13-17 May 2013 (attended).
- LPTHE, University Pierre and Marie Curie, Paris, France, 8 May-30 June 2013 (work visit).
Green, R. (UL)
- DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (attended).

Ivashko, A. (UL)
- *Large-scale magnetic fields in the universe and chiral anomaly*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).

Jacobs, V.P.J. (UU)
- *Strongly-coupled Weyl semimetals from AdS/CMT*, Physics@FOM Veldhoven 2013, the Netherlands, 22-23 January 2013 (poster).
- *A brief introduction to Weyl semimetals*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
- *Towards a holographic model for transport in Weyl semimetals*, PLaneT Talk, Utrecht University, the Netherlands, 7 May 2013 (talk).
- Gauge/Gravity 2013, Max Planck Institute Munchen, Germany, 29 July-2 August 2013 (attended).
- Arnold Sommerfield School, Gauge Gravity Duality and Condensed Matter Physics, Arnold Sommerfeld Center for Theoretical Physics, Munchen, Germany, 5-9 August 2013 (attended).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- *Towards a holographic model for transport in Weyl semimetals*, HD Group Meeting, Utrecht University, the Netherlands, 29 October 2013 (talk).
- Workshop, Physics with Industry, Lorentz Center Leiden, the Netherlands, 18-22 November 2013 (attended).

Jain, S.K. (UU)
- Shell Technology Center, Shell Experimental Labs and Plant, Amsterdam, the Netherlands, 2 September 2013 (work visit).
- AMOLF (FOM) Institute and Laboratories, Amsterdam, the Netherlands, 3 September 2013 (work visit).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- *Atomistic models of a Si-Solar cell*, Meeting and Presentations with Shell Coach and Colleagues (Solar energy experts), Amsterdam, the Netherlands, 10 December 2013 (talk).
- FOM Young Scientists Day, Lectures and two Workshops, Amsterdam, the Netherlands, 12 December 2013 (attended).

Janssen, M. (UU)
- DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (attended).
Koning, V. (UL)
- *Chiral symmetry breaking in toroidal nematic liquid crystals*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
- *Chiral symmetry breaking in nematic toroids*, Eindhoven University of Technology, the Netherlands, 15 May 2013 (talk).
- *Liquid crystal display technology in torus: a case of chiral symmetry breaking*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).

Licup, A.J. (VUA)
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- *Strange stiffening in collagen networks*, KNAW Biophysics, Amsterdam, the Netherlands, 12 November 2013 (talk).

Liu, K. (UL)
- *Quantum liquid crystal in 2+1d*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- UK-NL Condensed Matter Meeting, Bristol, UK, 29-30 August 2013 (attended).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

Mi, S. (UL)

Pikulin, D.I. (UL)
- *Zero-voltage conductance peak from weak antilocalization in a Majorana nanowire*, Physics@FOM Veldhoven 2013, the Netherlands, 22-23 January 2013 (talk).
- *Edge of the quantum spin Hall insulator as a platform for the detection and braiding Majorana fermions*, Condensed Matter Seminar, UC Riverside, USA, 15 May 2013 (talk).
- *Parity effects due to Majorana fermions on the quantum spin Hall insulator edge*, IXth Rencontres du Vietnam Conference, Quy-Nhon, Vietnam, 4-10 August 2013 (talk).
- *Exciton condensation in InAs/GaSb quantum wells in quantum spin Hall regime*, Condensed Matter Theory Seminar, Radboud University, Nijmegen, the Netherlands, 2 December 2013 (talk).

**Quelle, A. (UU)**
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

**Rademaker, L. (UL)**
- NHMFL Theory Winter School, Tallahassee, Florida, USA, 7-11 January 2013 (attended).
- *Bilayer excitons in strongly correlated materials*, National High Magnetic Field Laboratory Seminar, Tallahassee, Florida, USA, 1 February 2013 (talk).
- Universal Themes of Bose-Einstein Condensation, Workshop, Leiden University, the Netherlands, 11-15 March 2013 (attended).
- Frustration & cooperation in strongly correlated exciton condensates, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- *Dynamical frustration versus kinetic enhancement with excitons in strongly correlated bilayers*, UK-NL Condensed Matter Meeting, Bristol, UK, 30-31 August 2013 (talk).
- Theoretical Physics PhD D-Day Seminar, Utrecht, Workshop, the Netherlands, 27 September 2013 (co-organizer, attended).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended; co-organizer).
- Workshop, Hidden Order, Superconductivity, and Magnetism in URu2Si2, Lorentz Center, Leiden University, the Netherlands, 4-8 November 2013 (attended).

**Schram, R. (UL)**
- *The fractal globule*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
- *Exact enumeration of the Hamiltonian walk on the 4 x 4 x 4 cube*, Statphys 25, Seoul, South Korea, 22-26 July 2013 (poster).

**Slager, R.-J. (UL)**
- The space group classification of topological band insulators, Physics@FOM Veldhoven 2013, 22-23 January 2013 (poster).
- *The space group classification of topological band insulators*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).
- *Topological band insulators and crystal symmetries*, University of Amsterdam, the Netherlands, 29 May 2012 (talk).
- Workshop, Topological Phases of Matter, Cargese, Corsica, 24 June-6 July 2013 (attended).
- UK-NL Meeting, Workshop, Bristol, UK, 30-31 August 2013 (attended).
- *Topological band insulators and crystal symmetries*, Ruitenbeek group, Leiden University, the Netherlands, 21 September 2013 (talk).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

**Soligno, G. (UU)**
- *Computation of the minimum energy configuration of a particle at a flat interface through the triangular tessellation technique*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
- E(S)R Meeting and Transferable Skills and Proteins at Interfaces, SOMATAI Workshop T1, Technical University Eindhoven (TU/e), the Netherlands, 7-11 October 2013 (attended).
- Course (mainly) on Optical Spectroscopy of Interfaces, SOMATAI Workshop T3, Max-Planck-Institut fur Eisenforschung, Dusseldorf, Germany, 9-13 December 2013 (attended).

**Stegen, J. (UU)**
- *Phase separation in dense protein solutions*, Physics@FOM Veldhoven 2013, the Netherlands, 22-23 January 2013 (poster).
- *Phase separation in dense protein solutions*, BRM Meeting, Utrecht, the Netherlands, 10 June 2013 (talk).
- *Phase separation in dense protein solutions*, 7th International Discussion Meeting on Relaxation in Complex Systems, Barcelona, Spain, 24 July 2013 (talk).

**Sulangi, M. (UL)**
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

**Sybesma, W. (UU)**
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).

**Tompitak, M. (UL)**
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
Troppenz, T. (UU)
- *Phase behavior of hard polarizable colloidal rods in an external electric field*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).

van den Berg, R. (UvA)
- *Central spin models and numerical renormalization group methods*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
- Summer School Institute of Theoretical and Applied Physics, Turunc, Turkey, 4-8 August 2013 (attended).
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended).
- Brookhaven National Lab, Upton, USA, 30 November-16 December 2013 (work visit).

van der Bijl, E. (UU)
- DRSTP PhD Day, Utrecht, the Netherlands, 27 September 2013 (attended; co-organizer).

van Heck, B. (UL)
- *Flux-controlled quantum computation with Majorana fermions*, Physikzentrum RWTH Aachen, Germany, 2 May 2013 (talk).

van Heeringen, L. (RU)

van Heugten, J.J.R.M. (UU)

Vlijm, R.P. (UvA)
- *Dynamical correlation functions of higher spin chains*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013 (talk).
- *Dynamical correlation functions of higher spin chains*, DRSTP Symposium, Trends in Theory 2013, Dalfsen, the Netherlands, 16-17 May 2013 (poster).

- *Correlation functions of quantum integrable models, dynamical correlation functions of higher spin chains*, Dijon, France, 4-6 September 2013 (attended).

5 | Scientific staff (per 31-12-2013)

Below an overview is given of the permanent and temporary staff members of the DRSTP on 31 December 2013. The associate members are also listed. PhD students are listed in Chapter 4 (Section 4.4). Theme 1 refers to particle physics, cosmology, quantum gravity and string theory and theme 2 to quantum matter, quantum information, soft condensed matter and biophysics.

5.1 Permanent staff

<table>
<thead>
<tr>
<th>University of Amsterdam (UvA)</th>
<th>theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. S. Ando</td>
<td>1</td>
</tr>
<tr>
<td>Prof. F.A. Bais (emer. 2010)</td>
<td>1</td>
</tr>
<tr>
<td>Dr. G.F. Bertone</td>
<td>1</td>
</tr>
<tr>
<td>Prof. H.W. Capel (emer. prior to 2007)</td>
<td>2</td>
</tr>
<tr>
<td>Dr. A. Castro Anich</td>
<td>1</td>
</tr>
<tr>
<td>Prof. J.-S. Caux</td>
<td>2</td>
</tr>
<tr>
<td>Prof. J. de Boer</td>
<td>1</td>
</tr>
<tr>
<td>Dr. B.W. Freivogel</td>
<td>1</td>
</tr>
<tr>
<td>Dr. V. Gritsev</td>
<td>1</td>
</tr>
<tr>
<td>Dr. D.M. Hofman</td>
<td>1</td>
</tr>
<tr>
<td>Prof. J.H. Koch (emer. 2009)</td>
<td>1</td>
</tr>
<tr>
<td>Prof. E.L.M.P. Laenen</td>
<td>1</td>
</tr>
<tr>
<td>Prof. B. Nienhuis</td>
<td>2</td>
</tr>
<tr>
<td>Dr. Th.M. Nieuwenhuizen</td>
<td>2</td>
</tr>
<tr>
<td>Prof. A.M.M. Pruisken</td>
<td>2</td>
</tr>
<tr>
<td>Prof. C.J.M. Schoutens</td>
<td>2</td>
</tr>
<tr>
<td>Prof. K. Skenderis</td>
<td>1</td>
</tr>
<tr>
<td>Prof. J. Smit (emer. 2008)</td>
<td>1</td>
</tr>
<tr>
<td>Dr. L.G. Suttorp (emer. prior to 2007)</td>
<td>2</td>
</tr>
<tr>
<td>Prof. M.M. Taylor</td>
<td>1</td>
</tr>
<tr>
<td>Dr. L.J. van den Horn (emer. 2008)</td>
<td>1</td>
</tr>
<tr>
<td>Dr. J.P. van der Schaar</td>
<td>1</td>
</tr>
<tr>
<td>Dr. W.A. van Leeuwen (emer. 2008)</td>
<td>2</td>
</tr>
<tr>
<td>Prof. E.P. Verlinde</td>
<td>1</td>
</tr>
</tbody>
</table>
### Vrije Universiteit Amsterdam (VUA)

<table>
<thead>
<tr>
<th>Name</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. K. Allaart (emer. 2008)</td>
<td>2</td>
</tr>
<tr>
<td>Dr. B.L.G. Bakker (emer. 2009)</td>
<td>1</td>
</tr>
<tr>
<td>Prof. R. Fleischer</td>
<td>1</td>
</tr>
<tr>
<td>Prof. F.C. MacKintosh</td>
<td>2</td>
</tr>
<tr>
<td>Prof. P.J.G. Mulders</td>
<td>1</td>
</tr>
<tr>
<td>Dr. G.J. Stephens</td>
<td>2</td>
</tr>
<tr>
<td>Prof. T.D. Visser</td>
<td>2</td>
</tr>
<tr>
<td>Prof. P.R. ten Wolde</td>
<td>2</td>
</tr>
</tbody>
</table>

### University of Groningen (RUG)

<table>
<thead>
<tr>
<th>Name</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof. E.A. Bergshoeff</td>
<td>1</td>
</tr>
<tr>
<td>Prof. D. Boer</td>
<td>1</td>
</tr>
<tr>
<td>Prof. M. de Roo (emer. 2011)</td>
<td>1</td>
</tr>
<tr>
<td>Prof. E. Pallante</td>
<td>1</td>
</tr>
<tr>
<td>Dr. K. Papadodimas</td>
<td>1</td>
</tr>
<tr>
<td>Dr. D. Roest</td>
<td>1</td>
</tr>
<tr>
<td>Prof. R.G.E. Timmermans</td>
<td>1</td>
</tr>
<tr>
<td>Prof. A.C.D. van Enter</td>
<td>2</td>
</tr>
</tbody>
</table>

### Leiden University (UL)

<table>
<thead>
<tr>
<th>Name</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof. A. Achúcarro</td>
<td>1</td>
</tr>
<tr>
<td>Prof. G.T. Barkema</td>
<td>2</td>
</tr>
<tr>
<td>Prof. C.W.J. Beenakker</td>
<td>2</td>
</tr>
<tr>
<td>Prof. H.W.J. Blöte (emer. 2008)</td>
<td>2</td>
</tr>
<tr>
<td>Dr. A. Boyarsky</td>
<td>1</td>
</tr>
<tr>
<td>Dr. P.J.H. Denteneer</td>
<td>2</td>
</tr>
<tr>
<td>Dr. D. Garlaschelli</td>
<td>2</td>
</tr>
<tr>
<td>Prof. G. Nienhuis (emer. 2010)</td>
<td>2</td>
</tr>
<tr>
<td>Dr. A. Parnachev</td>
<td>1</td>
</tr>
<tr>
<td>Dr. K.E. Schalm</td>
<td>1</td>
</tr>
<tr>
<td>Prof. H. Schiessel</td>
<td>2</td>
</tr>
<tr>
<td>Prof. J.W. van Holten</td>
<td>1</td>
</tr>
<tr>
<td>Prof. J.M.J. van Leeuwen (emer. prior to 2007)</td>
<td>2</td>
</tr>
<tr>
<td>Dr. V. Vitelli</td>
<td>2</td>
</tr>
<tr>
<td>Prof. J. Zaanen</td>
<td>2</td>
</tr>
<tr>
<td>Radboud University Nijmegen (RU)</td>
<td>theme</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Dr. W.J.P. Beenakker</td>
<td>1</td>
</tr>
<tr>
<td>Prof. A. Fasolino</td>
<td>2</td>
</tr>
<tr>
<td>Prof. M.I. Katsnelson</td>
<td>2</td>
</tr>
<tr>
<td>Prof. R.H.P. Kleiss</td>
<td>1</td>
</tr>
<tr>
<td>Prof. H.J.F. Knops (emer. 2005)</td>
<td>2</td>
</tr>
<tr>
<td>Prof. R. Loll</td>
<td>1</td>
</tr>
<tr>
<td>Dr. F.S. Saueressig</td>
<td>1</td>
</tr>
<tr>
<td>Prof. A.N.J.J. Schellekens</td>
<td>1</td>
</tr>
<tr>
<td>Dr. M.J.M. Titov</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Utrecht University (UU)</th>
<th>theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof. G.E. Arutyunov</td>
<td>1</td>
</tr>
<tr>
<td>Prof. G.T. Barkema</td>
<td>2</td>
</tr>
<tr>
<td>Dr. R.A. Duine</td>
<td>2</td>
</tr>
<tr>
<td>Prof. M.H. Ernst (emer. prior to 2007)</td>
<td>2</td>
</tr>
<tr>
<td>Dr. L. Fritz</td>
<td>2</td>
</tr>
<tr>
<td>Dr. U. Gürsoy</td>
<td>1</td>
</tr>
<tr>
<td>Prof. E.L.M.P. Laenen</td>
<td>1</td>
</tr>
<tr>
<td>Prof. C. Morais Smith</td>
<td>2</td>
</tr>
<tr>
<td>Dr. D. Panja</td>
<td>2</td>
</tr>
<tr>
<td>Dr. T. Prokopec</td>
<td>1</td>
</tr>
<tr>
<td>Prof. Th.W. Ruijgrok (emer. prior to 2007)</td>
<td>1 / 2</td>
</tr>
<tr>
<td>Dr. D. Schuricht</td>
<td>2</td>
</tr>
<tr>
<td>Prof. J. Smit (emer. 2008)</td>
<td>1</td>
</tr>
<tr>
<td>Prof. H.T.C. Stoof</td>
<td>2</td>
</tr>
<tr>
<td>Prof. G. ’t Hooft</td>
<td>1</td>
</tr>
<tr>
<td>Prof. H. van Beijeren (emer. 2008)</td>
<td>2</td>
</tr>
<tr>
<td>Prof. P.P.A.M. van der Schoot</td>
<td>2</td>
</tr>
<tr>
<td>Prof. Dr. R.H.H.G. van Roi</td>
<td>2</td>
</tr>
<tr>
<td>Prof. S.J.G. Vandoren</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nikhef Theory Group (Nikhef)</th>
<th>theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof. B. de Wit (emer. 2010)</td>
<td>1</td>
</tr>
<tr>
<td>Prof. R. Fleischer</td>
<td>1</td>
</tr>
<tr>
<td>Prof. J.H. Koch (emer. 2009)</td>
<td>1</td>
</tr>
<tr>
<td>Prof. E.L.M.P. Laenen</td>
<td>1</td>
</tr>
<tr>
<td>Dr. M. Postma</td>
<td>1</td>
</tr>
<tr>
<td>Prof. A.N.J.J. Schellekens</td>
<td>1</td>
</tr>
<tr>
<td>Prof. J.-W. van Holten</td>
<td>1</td>
</tr>
<tr>
<td>Dr. J.A.M. Vermaseren</td>
<td>1</td>
</tr>
</tbody>
</table>
### 5.2 Temporary staff

<table>
<thead>
<tr>
<th>University of Amsterdam (UvA)</th>
<th>theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. G.P. Brandino</td>
<td>2</td>
</tr>
<tr>
<td>Dr. M. Brockmann</td>
<td>2</td>
</tr>
<tr>
<td>Dr. M.E. Cabrera Catalan</td>
<td>1</td>
</tr>
<tr>
<td>Dr. F. Calore</td>
<td>1</td>
</tr>
<tr>
<td>Dr. M.P. Heller</td>
<td>1</td>
</tr>
<tr>
<td>Dr. J.I. Jottar</td>
<td>1</td>
</tr>
<tr>
<td>Dr. V.T. Lahtinen</td>
<td>2</td>
</tr>
<tr>
<td>Dr. M.S. Lippert</td>
<td>1</td>
</tr>
<tr>
<td>Dr. M. Lovell</td>
<td>1</td>
</tr>
<tr>
<td>Dr. D.G. Robbins</td>
<td>1</td>
</tr>
<tr>
<td>Dr. M. Snoek</td>
<td>2</td>
</tr>
<tr>
<td>Dr. H.-S. Tan</td>
<td>1</td>
</tr>
<tr>
<td>Dr. M. Vonk</td>
<td>1</td>
</tr>
<tr>
<td>Dr. I.-S. Yang</td>
<td>1</td>
</tr>
<tr>
<td>Dr. F. Zandanel</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vrije Universiteit Amsterdam (VUA)</th>
<th>theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. M. Garcia Echevarria</td>
<td>1</td>
</tr>
<tr>
<td>Dr. T. Kasemets</td>
<td>1</td>
</tr>
<tr>
<td>Dr. C. Pisano</td>
<td>1</td>
</tr>
<tr>
<td>Dr. M. Vahabi</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>University of Groningen (RUG)</th>
<th>theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. H.R. Afshar</td>
<td>1</td>
</tr>
<tr>
<td>Dr. S. Banerjee</td>
<td>1</td>
</tr>
<tr>
<td>Dr. M. Özkan</td>
<td>1</td>
</tr>
<tr>
<td>Dr. S.S. Schlesser</td>
<td>1</td>
</tr>
<tr>
<td>Dr. E.I. Zavala Carrasco</td>
<td>1</td>
</tr>
<tr>
<td><strong>Leiden University (UL)</strong></td>
<td><strong>theme</strong></td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Dr. M. Burello</td>
<td>2</td>
</tr>
<tr>
<td>Dr. B. Chen</td>
<td>2</td>
</tr>
<tr>
<td>Dr. D. Chevallier</td>
<td>2</td>
</tr>
<tr>
<td>Dr. O. Cobanero</td>
<td>1</td>
</tr>
<tr>
<td>Dr. R. Davison</td>
<td>1</td>
</tr>
<tr>
<td>Dr. B. Eslami</td>
<td>2</td>
</tr>
<tr>
<td>Dr. B. Hu</td>
<td>1</td>
</tr>
<tr>
<td>Dr. T. Hyart</td>
<td>2</td>
</tr>
<tr>
<td>Dr. N. Kaplis</td>
<td>2</td>
</tr>
<tr>
<td>Dr. S. Klug</td>
<td>2</td>
</tr>
<tr>
<td>Dr. J. Nissinen</td>
<td>2</td>
</tr>
<tr>
<td>Dr. J. Paulose</td>
<td>2</td>
</tr>
<tr>
<td>Dr. W. Valkenburg</td>
<td>1</td>
</tr>
<tr>
<td>Dr. K. Wu</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Radboud University Nijmegen (RU)</strong></th>
<th><strong>theme</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. A. Contillo</td>
<td>1</td>
</tr>
<tr>
<td>Dr. J. Cooperman</td>
<td>1</td>
</tr>
<tr>
<td>Dr. S. Gryb</td>
<td>1</td>
</tr>
<tr>
<td>Dr. F. Vidotto</td>
<td>1</td>
</tr>
<tr>
<td>Dr. O. Zanusso</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Utrecht University (UU)</strong></th>
<th><strong>theme</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. M. Crichigno</td>
<td>1</td>
</tr>
<tr>
<td>Dr. W. Galleas</td>
<td>1</td>
</tr>
<tr>
<td>Dr. A. Gnecchi</td>
<td>1</td>
</tr>
<tr>
<td>Dr. A. Härtel</td>
<td>2</td>
</tr>
<tr>
<td>Dr. V. Juricic</td>
<td>2</td>
</tr>
<tr>
<td>Dr. T. Matsumoto</td>
<td>1</td>
</tr>
<tr>
<td>Dr. L. Mazzanti</td>
<td>1</td>
</tr>
<tr>
<td>Dr. T. Zingg</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Nikhef Theory Group (Nikhef)</strong></th>
<th><strong>theme</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. P. Artoisenet</td>
<td>1</td>
</tr>
<tr>
<td>Dr. D. Butter</td>
<td>1</td>
</tr>
<tr>
<td>Dr. G. Inverso</td>
<td>1</td>
</tr>
<tr>
<td>Dr. K. Larsen</td>
<td>1</td>
</tr>
<tr>
<td>Dr. S. Nawata</td>
<td>1</td>
</tr>
<tr>
<td>Dr. K. Petraki</td>
<td>1</td>
</tr>
<tr>
<td>Dr. M. Ritzmann</td>
<td>1</td>
</tr>
<tr>
<td>Dr. O. Taanila</td>
<td>1</td>
</tr>
<tr>
<td>Dr. W. Waalewijn</td>
<td>1</td>
</tr>
</tbody>
</table>
5.3 Associate members

Prof. H. Dekker (UvA) (emer. prior to 2007) 2
Prof. H.A. de Raedt (RUG) 2
Prof. L.-F. Feiner (Philips) 2
Prof. B.J. Hoenders (RUG) (emer. 2010) 2
Dr. L.P.J. Kamp (TU/e) 2
Prof. J. Knoester (RUG) 2
Prof. D. Lohse (UT) 2
Prof. M.V. Mostovoy (RUG) 2
Theoretical and Polymer Physics Group (TU/e) 2
6 | Academic publications

This chapter presents an overview of publications in refereed journals published in 2013. The publications belonging to theme 1 and theme 2 are given separately. Within each theme the publications are ordered according to affiliation. Data concerning staff members: G.T. Barkema (UU/UL), B. de Wit (Nikhef/UU), R. Fleischer (Nikhef/VUA), E.L.M.P. Laenen (Nikhef/UU/UvA), A.N.J.J. Schellekens (Nikhef/RU) and J.-W. van Holten (Nikhef/UL) is listed under their primary affiliation. Publications by associate members are not included. Professional publications are listed in Chapter 8.

6.1 Theme 1

University of Amsterdam

– Anderhalden, D., Schneider, A., Maccio, A.V., Diemand, J. and Bertone, G., Hints on the nature of dark matter from the properties of Milky Way satellites, JCAP 1303 (2013) 014.
– Ando, S., Multimessenger astronomy with gravitational waves and high-energy neutrinos, Rev. Mod. Phys. 85 (2013) 1401-1420.

89
- Cabrera, M.E., Casas, J.A. and Ruiz de Austri, R. *The health of SUSY after the Higgs discovery and the XENON100 data*, JHEP 1307 (2013) 182.

**Vrije Universiteit Amsterdam**

**University of Groningen**
measurement of atomic parity violation in a single Ra+ ion, Hyperfine Interact. 214 (2013) 157-162.

Leiden University
− Prokofyev, R., Demartini, G., Boyarsky, A., Ruchayskiy, O. and Cudre-
  Mauroux, P., *Ontology-based word sense disambiguation for scientific
− Sawicki, I., Marra, V. and Valkenburg, W., *Seeding supermassive black
  holes with a nonvortical dark-matter subcomponent*, Phys. Rev. D 88
− Schalm, K., Shiu, G. and van der Aalst, T., *Consistency condition for
  inflation from (broken) conformal symmetry*, JCAP 1303 (2013) 005.

**Radboud University Nijmegen**
  of loop quantum cosmology: confronting quantum gravity with
− Ambjørn, J., Görlich, A., Jurkiewicz, J. and Loll, R., *Causal dynamical
  triangulations and the search for a theory of quantum gravity*, Int. J. Mod.
− Beenakker, W., Janssen, T., Lepoeter, S., Krämer, M., Kulesza, A.,
  Laenen, E., Niessen, I. and Thewes, S., et al., *Towards NNLL
  resummation: hard matching coefficients for squark and gluino
  hadroproduction*, JHEP 1310 (2013) 120.
− Belanger, G., Godbole, R.M., Hartgring, L. and Niessen, I., *Top
  polarization in stop production at the LHC*, JHEP 1305 (2013) 112.
− van den Broek, Th. and van Suijlekom, W.D., *Going beyond the standard
  model with noncommutative geometry*, JHEP 1303 (2013) 112.
− Budd, T.G. and Loll, R., *Exploring torus universes in causal dynamical
− Calcagni, G., Eichhorn, A. and Saueressig, F., *Probing the quantum
− Codello, A. and Zanusso, O., *Renormalization group flow of hexatic
− Jordan, S. and Loll, R., *De Sitter universe from causal dynamical
− Koch, B. and Saueressig, F., *Structural aspects of asymptotically safe
− Kreienbühl, A. and Pawlowski, T., *Singularity resolution from polymer
− Papadopoulos, C.G., Kleiss, R.H.P. and Malamos, I., *Reduction at the
  interactions S=0,-1,-2,-3,-4*, Few-Body Systems 54 (2013) 801-806.
− Rovelli, C. and Vidotto, F., *Evidence for maximal acceleration and
  111 (2013) 091303.

**Utrecht University**

Nikhef Theory Group

6.2 Theme 2

University of Amsterdam


Vrije Universiteit Amsterdam


- de Ronde, W.H. and ten Wolde, P.R., De biologische cel als minicomputer, NTvN 79 (2013) 30-34.


**University of Groningen**

**Leiden University**
Radboud University Nijmegen


**Utrecht University**


7 | Scientific activities

This chapter contains an overview of talks given by staff members at (international) conferences, seminars, symposia, colloquia, meetings, workshops, lecture courses given at schools and universities and poster presentations of staff members and postdoctoral fellows. Data concerning staff members G.T. Barkema (UU/UL), B. de Wit (Nikhef/UU), R. Fleischer (Nikhef/VUA), E.L.M.P. Laenen (Nikhef/UU/UvA), A.N.J.J. Schellekens (Nikhef/ RU) and J.-W. van Holten (Nikhef/UL) is listed under their primary affiliation. A list of public lectures is available in Chapter 8 (Section 8.2). An overview of scientific activities held by PhD students is presented in Chapter 4 (Sections 4.6 and 4.7).

7.1 Theme 1

University of Amsterdam

− Ando, S., Seeing dark matter disappear: astrophysical dark matter searches, FOM@Veldhoven, the Netherlands, 23 January 2013.
− Ando, S., CTA and X-ray prospects for indirect dark matter searches, x-raying the gamma-ray universe, CTA-X-Ray LINK Meeting, Hakone-Yumoto, Japan, 4-6 November 2013.
− Arina, C., Reconstruction of the dark matter parameters with XENON1T and IceCube86, Cosmostats 2013, Banff, Canada, March 2013.

Arina, C., *Complementarity between direct detection and neutrino signals*, Desy, Hamburg, Germany, April 2013.


Arina, C., *Recent results from CDMS silicon data for dark matter direct searches and theoretical implications for WIMPs*, Cosmology Meeting, University of Amsterdam, the Netherlands, June 2013.

Arina, C., *Dark matter direct detection and the complementarity with indirect searches*, Seminar, Max Planck Institute, Munich, Germany, July 2013.


Bertone, G., *Identifying dark matter*, Theory Group@Nikhef, Amsterdam, the Netherlands, April 2013.

Bertone, G., *Dark matter searches at the LHC and elsewhere*, ATLAS-SUSY Group Workshop, Nikhef, Amsterdam, the Netherlands, April 2013.


de Boer, J., *What is vacuum?*, NEVAC Day, Amsterdam, the Netherlands, 23 April 2013.


de Boer, J., *(Entanglement)entropy in higher spin theories*, 2nd Mediterranean Conference, Classical and Quantum Gravity (2nd
- de Boer, J., (Entanglement)entropy in higher spin theories, Swansea University, UK, 16 July-19 July 2013.
- de Boer, J., Two interesting questions in 2d CFTs, Isaac Newton Institute for Mathematical Sciences, Holography: From Gravity to Quantum Matter, Cambridge, UK, 16-20 September 2013.
- de Boer, J., The entropy of a hole in spacetime, Quantum Aspects of Black Holes and its Recent Progress Workshop, Yerevan, Armenia, 24 September 2013.
- de Boer, J., Entropy in higher spin theories, black holes in string theory, Workshop, Michigan, USA, 7-18 October 2013.
- de Boer, J., Entanglement in gravity, DRSTP National Seminar Theoretical High Energy Physics (THEP), Nikhef, Amsterdam, the Netherlands, 22 November 2013.
- de Boer, J., 98 years of black holes -- what have we learned, Theoretical Physics Colloquium, Utrecht, the Netherlands, 27 November 2013.
- Freivogel, B.W., Black hole horizons and quantum information, dynamics of the string theory landscape, Cern, Switzerland, 21-29 March 2013.
- Freivogel, B.W., Cosmological frontiers in fundamental physics, Perimeter Institute, Waterloo, Canada, 8-11 July 2013.
- Freivogel, B.W., Foundations and new methods in theoretical physics, Summer School for Graduate Students, Saalburg, Germany, 2-12 September 2013.
- Heller, M.P., Holographic view on thermalization of strongly coupled matter, Physics@FOM, Veldhoven, the Netherlands, January 2013.
- Heller, M.P., Two interesting lessons about hydrodynamics from holography & Condensed matter physics of holographic QCD: a quest for the quarkyonic phase, Seminar, Leiden University, the Netherlands, March 2013.
- Heller, M.P., Recent lessons about hydrodynamics from holography & Towards holographic heavy ion collisions, Seminar, HKUST Institute for Advanced Studies, Hong Kong, China, June 2013.
− Heller, M.P., *Holographic approach to non-equilibrium gauge theories: from new lessons about hydrodynamics to toy models of heavy ion collisions*, Strongly Interacting Field Theories, Jena, Germany, November 2013.
− Hofman, D.M., *Applications of holography*, Lecture Series, 6th Taiwan String Theory Workshop, National Taiwan University, Taipei, Taiwan, 12-15 December 2013.
− Lippert, M.S., *Holographic model of the quantum Hall effect*, String Group Seminar, Santiago de Compostela, Spain, 3 May 2013,


Verlinde, E.P., *Passing through the firewall*, Workshop, Fuzz or Fire, Santa Barbara, USA, 25 August 2013.


Verlinde, E.P., *Quantum information and emergent space-time*, Seminar, Amsterdam, the Netherlands, 23 October 2013.


---

**Vrije Universiteit Amsterdam**

Mulders, P.J.G., *The role of transverse momenta and spins in QCD at high energies*, Theoretical Physics Scientific Theory Seminar, Physics Department, Roma University La Sapienza, Rome, Italy, 11 February 2013.

Mulders, P.J.G., *Beyond collinearity in high energy QCD processes*, DRSTP National Seminar Theoretical High Energy Physics (THEP), Nikhef, Amsterdam, the Netherlands, 1 March 2013.


Mulders, P.J.G., *Intrinsic transverse momenta at high energies*, Multiparton Dynamics Working Group Meeting (QCD@LH2013), Hamburg, Germany, 2 September 2013.


- Pisano, C., *Probing the linear polarisation of gluons inside the proton at the LHC*, NNV Fall Meeting, Lunteren, the Netherlands, 1 November 2013.


**University of Groningen**


− Papadodimas, K., *AdS/CFT and the cosmological constant problem*, University of Amsterdam, the Netherlands, 15 January 2013.
− Papadodimas, K., *Falling into a black hole and the information paradox in AdS/CFT*, Utrecht University, the Netherlands, 15 March 2013.
− Papadodimas, K., *An infalling observer and the black hole information paradox in AdS/CFT*, University of Padova, Italy, 8 May 2013.
− Papadodimas, K., *Falling into a black hole and the information paradox in AdS/CFT*, 20th General Relativity and Gravitational Waves Meeting, Warsaw, Poland, 10 July 2013.
- Papadodimas, K., *The black hole interior in AdS/CFT and the information paradox*, University of Amsterdam, the Netherlands, 3 December 2013.
- Roest, D., *The periodicity of maximal supergravity*, AEI Potsdam, Germany, 30 April 2013.
- Roest, D., *Inflation and (super-)symmetry*, University of Göttingen, Germany, 19 June 2013.
- Roest, D., *The universal attractor of inflation*, IFT Amsterdam, the Netherlands, 10 December 2013.
- Zavala, I., *D-branes and cosmic structure in the universe*, National FOM String Meeting, Utrecht, the Netherlands, June 2013.
- Zavala, I., *Planck inflation and the Kähler potential in supergravity and string theory*, SUSY13, ICTP, Trieste, Italy, August 2013.

**Leiden University**
- Achúcarro, A., *Correlating features in the primordial spectra*, 47th ESLAB Conference, Planck Conference, ESA, Noordwijk, the Netherlands, 2-5 April 2013 (poster).
- Cobanera, E., *A new theory of dualities, holographic symmetries, and the search of generalized order parameters for topological order*, University of Amsterdam, the Netherlands, 16 January 2013.
- Parnachev, A., *Comments on holographic finite density matter*, University of Chicago, USA, 16 January 2013.
- Parnachev, A., *Holographic tachyon*, FOM@Physics, Veldhoven, the Netherlands, 26 January 2013.
- Parnachev, A., *Comments on holographic finite density matter*, Weizmann Institute, Tel Aviv, Israel, 13 February 2013.
− Parnachev, A., *Comments on holographic finite density matter*, IAS Seminar, Princeton University, New Jersey, USA, 8 November 2013.
− Schalm, K.E., *Strongly coupled electron systems from holography: the birth and collapse of anti-de-Sitter stars*, CERN Theory Seminar, Switzerland, 29 January 2013.
− Schalm, K.E., *Strongly coupled electron systems from holography: the birth and collapse of anti-de-Sitter stars*, University of Geneva, Switzerland, 1 February 2013.
− Schalm, K.E., *Introduction to non-perturbative phenomena in field theory, solitons and duality*, DRSTP Postgraduate Course, Statistical Physics and Theory of Condensed Matter (SPTCM), Doorn, the Netherlands, 4-15 March 2013.
− Schalm, K.E., *Far from equilibrium dynamics in CFTs and holography*, Isaac Newton Institute, Cambridge, UK, 16-20 September 2013.
− Valkenburg, W., *H0: Reconciling 73.8 km/s/Mpc with Planck*, Planck Conference, ESA, Noordwijk, the Netherlands, 2 April 2013 (poster).
− Valkenburg, W., *Relativistic corrections in 2LPT*, PTChat@Cargese, France, 2 May 2013.
− Valkenburg, W., *The role of time in cosmology*, jDPG, Wolfsburg, Germany, 2 June 2013.
− Valkenburg, W., *Relativistic corrections in Lagrangian perturbation theory*, Sterrewacht Leiden, the Netherlands, 13 November 2013
- Valkenburg, W., *Quantifying the Copernican principle and cosmic variance on H0*, 27th Texas Symposium, Relativistic Astrophysics, USA, 10 December 2013.

**Radboud University Nijmegen**
- Beenakker, W., *Higgs, Higgses or Higgs-like? Electroweak symmetry breaking in the SM or beyond*, Physics@FOM Veldhoven, the Netherlands, 23 January 2013.
- Beenakker, W., *Supersymmetry through the eyes of Higgs*, University of Groningen, the Netherlands, 18 March 2013.
- Beenakker, W., *Supersymmetry through the eyes of Higgs*, Theory Seminars, University of Groningen, the Netherlands, 18 March 2013.
- Kleiss, R., *Noncommutative geometry and particle physics*, Lorentz Center Leiden, the Netherlands, 14-18 October 2013.
- Loll, R., *Quantum spacetime, from a practioner's point of view*, DRSTP National Seminar Theoretical High Energy Physics (THEP), Nikhef, Amsterdam, the Netherlands, 1 March 2013.
- Loll, R., *Quantum gravity on your desktop: the emergence of spacetime*, IMAPP Meeting, Radboud University, Nijmegen, the Netherlands, 20 June 2013.
- Loll, R., *Causal dynamical triangulations without preferred foliation*, 20th International Conference on General Relativity and Gravitation (GR20), Warsaw, Poland, 7-13 July 2013.
- Saueressig, F., *Asymptotically safe gravity - a pedagogical introduction*, HEP Colloquium, Radboud University, the Netherlands, 13 May 2013.
- Saueressig, F., *Asymptotically safe gravity - a pedagogical introduction*, University of Groningen, the Netherlands, 3 June 2013.
- Saueressig, F., *Asymptotically safe gravity - a pedagogical introduction*, Utrecht University, the Netherlands, 5 June 2013.
- Vidotto, F., *Maximal acceleration in covariant loop gravity and singularity resolution*, 20th International Conference, General Relativity and Gravitation (GR20), Warsaw, Poland, 7-13 July 2013.

**Utrecht University**
− Crichigno, M., *Generalized gauged linear Sigma models*, ITP, Utrecht University, the Netherlands, 4 October 2013.
− Galleas, W., *Elliptic solid-on-solid models through functional equations*, Seminar, Elliptic Integrable Systems and Hypergeometric Functions, University of Amsterdam, the Netherlands, 24 June 2013.
− Gürsoy, U., Universal features of the quark-gluon plasma and holography, National Seminar in High Energy Physics, Nikhef, Amsterdam, the Netherlands, 23 November 2012
− Mazzanti, L., *Probes in holographic plasmas with unquenched quarks*, Institute for Theoretical Physics, Utrecht University, the Netherlands, February 2013.
- ’t Hooft, G., *Superstring theory and the foundations of quantum mechanics*, University of Padua, Italy, 6 March 2013.
- ’t Hooft, G., *The boundary between classical and quantum physics*, High Energy Frontier Theory Initiative (HEFTI), UC Davis, Sacramento, California, USA, 5 September 2013.
- ’t Hooft, G., *Exact conformal symmetry in gravity*, Kallosh-Shenker-Fest, Stanford, California, USA, 10 September 2013.
- ’t Hooft, G., *Moving into outer space*, Turkish Exporters Assembly, 2nd Annual Turkey Innovation Week Mars One, Istanbul, Turkey, 30 November 2013.

**Nikhef Theory Group**
- de Wit, B., *Subleading corrections to BPS black hole entropy; higher-derivative N=2 supersymmetric invariants and the 5D-4D connection*, Iberian Strings 2013, IST Lisboa, Portugal, 22 January 2013.
- de Wit, B., *On shell or off shell; is that the question?*, Workshop, Toine 60, Leuven, Belgium, 16 March 2013.
- de Wit, B., *Deformed gauged SO(8) supergravities and their possible embedding in M-theory*, Workshop, Topics in Holography, Supersymmetry and Higher Derivatives, Texas A&M University, College Station, USA, 23 April 2013.
- de Wit, B., *The construction and use of N=2 supersymmetric higher-derivative couplings*, Workshop, Meeting on Branes, Strings and Higher Derivatives, Texas A&M University, College Station, USA, 25 April 2013.
- de Wit, B., *Deformed gauged SO(8) supergravities: what can they tell us about M-theory?*, SFB Space-Time-Matter, Albert-Einstein Institute, Golm, Germany, 4 June 2013.
- de Wit, B., *Deformed gauged SO(8) supergravities: what can they tell us about M-theory?*, McGill University, Montreal, Canada, 29 July 2013.
- de Wit, B., *On supersymmetric black holes*, Frontiers of Quantum Gravity and Cosmology, Stanford University, Palo Alto, California, USA, 9-12 September 2013.
- de Wit, B., *Deformed gauged SO(8) supergravities: what can they tell us about M-theory?*, CEA Saclay, France, 25 September 2013.
- de Wit, B., *Deformations of special geometry: searching for the topological string*, Workshop, Geometry of Strings and Fields, Galileo Galilei Institute for Theoretical Physics, Arcetri, Florence, Italy, 2 October 2013.
- de Wit, B., *Deformations of special geometry: searching for the topological string*, Conference, Frontiers and New Perspectives in Geometry and Physics, Euler Institute St. Petersburg, Russia, 14 October 2013.
- de Wit, B., *On supersymmetric black holes*, Mini-Symposium, Groningen, the Netherlands, 18 October 2013.

### 7.2 Theme 2

**University of Amsterdam**

− Caux, J.-S., *Releasing the trapped 1d Bose gas: from integrability and renormalization to Generalized Gibbs ensembles*, Joint Meeting, APS Division of Atomic, Molecular & Optical Physics and the CAP Division of Atomic, Molecular & Optical Physics, Quebec, Canada, 4 June 2013.
− Caux, J.-S., *Theories for quantum wires: recent happenings in Luttinger liquid theory*, 14th International Conference, Formation of Semiconductor Interfaces (ICFSI-14), Gyeongju, South Korea, 2 July 2013.
- Lahtinen, V.T., *Condensate-induced transitions and critical spin chains / Hierarchy of exactly solvable spin-1/2 chains with so(N)_1 critical points*, Seminar, University of Leiden, the Netherlands, June 2013.
- Nieuwenhuizen, T.M., *A sub-quantum arrow of time*, EmQm13 (Emergent Quantum Mechanics), Vienna, Austria, 3-6 October 2013.

**Vrije Universiteit Amsterdam**
- Dennison, M.J., *Fluctuation-stabilized marginal networks and anomalous entropic elasticity*, Physics@FOM, Veldhoven, the Netherlands, 22-23 January 2013.

**University of Groningen**
- van Enter, A.C.D., *Gibbs-non-Gibbs transitions for measures on Cayley trees*, University of Delft, the Netherlands, 14 February 2013.
- van Enter, A.C.D., *Bootstrap percolation, the role of anisotropy. Questions, some answers and applications*, Utrecht Stochastic Seminar, Utrecht University, the Netherlands, 25 March 2013.
- van Enter, A.C.D., *Bootstrap percolation, the role of anisotropy. Questions, some answers and applications*, University of Oldenburg, Germany, 18 April 2013.
- van Enter, A.C.D., *Aperiodic order in equilibrium systems*, 12th International Conference on Quasicrystals (ICQ12), Cracow, Poland, 1 September 2013.
- van Enter, A.C.D., *Anisotropic bootstrap percolation*, University of Bologna, Italy, 18-20 September 2013.
- van Enter, A.C.D., *Gibbs-non-Gibbs transitions for measures on Cayley trees*, University of Bologna, Italy, 18-20 September 2013.
- van Enter, A.C.D., *Aperiodic order in equilibrium systems*, University of Bologna, Italy, 18-20 September 2013.

**Leiden University**
- Beenakker, C.W.J., *Search for Majorana fermions in superconductors*, NNV Subatomaire Fysicadag, Lunteren, the Netherlands, 1 November 2013.
- Beenakker, C.W.J., *Search for Majorana fermions in superconductors*, National Tsing Hua University, Hsinchu, Taiwan, 8 November 2013.
- Beenakker, C.W.J., *Search for Majorana fermions in superconductors*, National Taiwan University, Taipei, Taiwan, 11 November 2013.
- Garlaschelli, D., *Jan Tinbergen’s legacy in the physics of economic networks: from gravity to quantum statistics*, This Week’s Discoveries, Leiden University, the Netherlands, May 2013.
- Hyart, T., *Topological quantum computation with Majorana zero modes*, University of Oulu, Finland, 16 October 2013.
- Juricic, V., The space group classification of topological band insulators, Institute for Theoretical Physics, University of Amsterdam, the Netherlands, February 2013.
- Juricic, V., The space group classification of topological band insulators, Institute of Physics, University of Belgrade, Serbia, April 2013.
- Juricic, V., Relativistic quantum criticality in graphene, Institute for Theoretical Physics, Federal University of Rio de Janeiro, Brazil, April 2013.
- Kaplis, N., Quantum renormalization group and holography, Leiden, the Netherlands, October 2013.
- Kaplis, N., Non-equilibrium T=0 Reisner Nordstrom black holes, Leiden, the Netherlands, November 2013.
- Paulose, J., Buckling shells with soft spots, 15th Dutch Soft Matter Meeting, TU Delft, the Netherlands, 8 November 2013.
- Schiessel, H., Euler elastics and their applications to DNA, nucleosomes and chromatin fibers, BSS Seminar, Cavendish Laboratory, Cambridge, UK, 2 February 2014.
- Schiessel, H., Theory of DNA-cationic micelle complexation, Symposium, One Hundred Years of Micelles: Advances in Molecular Self-Assembly, Spring ACS National Meeting, New Orleans, USA, 4 April 2013.
- Schiessel, H., Exotic polymer physics with DNA molecules, IPF Seminar, Leibniz Institut für Polymerforschung, Dresden, Germany, 7 May 2013.
- Squartini, T., Stationary and non-stationary behavior of meso-scale and macro-scale networks, Econophysics and Networks Across Scales, Instituut-Lorentz for Theoretical Physics, Leiden, the Netherlands, 27-31 May 2013.
- Squartini, T., Financial complex networks, NetSci 2013, Royal Library, Copenhagen, Denmark, 3-7 June 2013.
- Sun, Y.-W., *Bose-Fermi competition in holographic metals*, KIPTC, Beijing, China, 20 June 2013.
- Sun, Y.-W., *Bose-Fermi competition in holographic metals*, Peking University, Beijing, China, June 2013.
- Vitelli, V., *From cooperativity in supercooled liquids to plasticity of amorphous solids*, CECAM Conference, ETH Zurich, Switzerland, 27 June 2013.

**Radboud University Nijmegen**

- Katsnelson, M.I., *Graphene: CERN on the desk*, Chebyshev Laboratory, St. Petersburg State University, Russia, 3-7 March 2013.
− Katsnelson, M.I., *In my element: through the periodic table with pen and computer*, Spinoza Lecture, the Hague, the Netherlands, September 2013.
− Katsnelson, M.I., *CERN on the desk*, Colloquium, Opening New Year, Utrecht University, the Netherlands, September 2013.

**Utrecht University**
- Jain, S.K., Atomistic models of a Si Solar cell, Meeting and Presentation, Shell Office, Amsterdam, the Netherlands, 10 December 2013.
- Morais Smith, C., Fractals and the quantum Hall effect, Mathematics Department Colloquium, Utrecht University, the Netherlands, 28 March 2013.
- Morais Smith, C., Magnetism with ultracold atoms in optical lattices, Thematic Symposium, Magnetism in Low-Dimensional Systems, XXXVI Brazilian Meeting, Condensed Matter Physics, Aguas de Lindoia, Brazil, 13 May 2013.
- Morais Smith, C., Let’s get high and cool: fermions and bosons in higher bands, Physics Department Colloquium, Edinburgh University, Scotland, UK, 27 November 2013.
- Morais Smith, C., Let’s get high and cool: fermions and bosons in higher bands, Physics Department Colloquium, St. Andrews University, Scotland, UK, 29 November 2013.
- Panja, D., Anomalous polymer dynamics... anomalous? It is quite normal, Albert-Ludwigs-University, Freiburg, Germany, 17 June 2013.
- Panja, D., Bacteriophages: fantastic little machines for infecting bacteria, University of Warwick, UK, 19 September 2013.
− Schuricht, D., *Relaxation dynamics of one-dimensional systems after a quantum quench*, Seminar, Condensed Matter and Statistical Physics, Institute for Theoretical Physics, University of Amsterdam, the Netherlands, 4 December 2013.
8 | Scientific-related activities

This chapter presents an overview of the science-related activities of DRSTP staff members and postdoctoral fellows. Here we list publications about (or related to) physics in a variety of printed media in Section 8.1. In Section 8.2 public lectures are listed. All other outreach activities such as forum discussions, television/radio interviews, personal columns in newspapers etc. are listed in the paragraph ‘other contributions’ (Section 8.3). Science-related activities of PhD students can be found in Chapter 4 (Sections 4.6 and 4.7).

8.1 Physics-related publications


8.2 Public lectures

- Bais, F.A., Complexity revisited, Santa Fe Comenius Course, Leusden, the Netherlands, 29 January 2013.
− Bais, F.A., *Symmetry breaking and phase transitions*, SFI Complex Systems Summer School, Santa Fe, New Mexico, USA, 8-13 June 2013.
− Bais, F.A., *Omn zien in dankbaarheid: de geschiedenis van de geschiedenis*, Valedictory Ceremony Anne Kox, Amsterdam, the Netherlands, 12 September 2013.
− Bais, F.A., *Touching tomorrow's world with today's science*, Lecturer and Moderator, Santa Fe/Comenius Workshop, Santa Fe, New Mexico, USA, 5-14 October 2013.
- Bergshoeff, E.A., *Wat is licht?*, Discovery Truck, Comenius College, Leeuwarden, the Netherlands, May 2013.
- Bergshoeff, E.A., *Wat is quantum zwaartekracht?*, University of Groningen, FMNS Honours College Summer School 2013, At the Frontiers of Science, Kloosterburen, the Netherlands, August 2013.
- Bergshoeff, E.A., *Wat is zwaartekracht?*, Groninger Vereniging voor Weeren Sterrenkunde (GVWS), Groningen, the Netherlands, October 2013.
- Bergshoeff, E.A., *How does gravity work?*, South American Institute for Fundamental Research (SAIFR), Sao Paulo, Brazil, November 2013.
- Caux, J-S., *Quantum cryptografie en quantum computers*, Proefcollege Natuurkunde (for prospective physics students) University of Amsterdam, the Netherlands, 29 January 2013.
- Caux, J-S., *The pursuit of exactness in quantum physics*, Oratie, University of Amsterdam, the Netherlands, 21 June 2013.
- de Boer, J., *Hoe meet je tijd?*, NEMO Kinderlezing, Amsterdam, the Netherlands, 10 February 2013.
- de Boer, J., *How to get a PhD*, PhD Information Evening, organized by the NSA, Amsterdam, the Netherlands, 28 February 2013.
- de Boer, J., *Quantum zwaartekracht*, Master Class for High School Students, Amsterdam, the Netherlands, 5 November 2013.
- de Boer, J., *Quantum zwaartekracht*, 2 hour lecture, College Club, Amsterdam, the Netherlands, 13 November 2013.
- Fasolino, A., *Graphene for science and society, the role of computer simulations*, Surf for Sara, Amsterdam Science Park, the Netherlands, 14 June 2013.
- Morais Smith, C., Aguas de Lindoia, 2 hour tutorial, Ultracold Atoms in Optical Lattices, XXXVI Brazilian Meeting on Condensed Matter Physics, 13 May 2013.
- Morais Smith, C., *The cool world of ultracold atoms*, Inaugural Lecture to new students, Utrecht University, the Netherlands, 6 September 2013.
- Morais Smith, C., *100 years of superconductivity*, UCU Open Days, University College Utrecht, the Netherlands, 22 November 2013.

- Schalm, K.E., *How black holes can explain condensed matter mysteries or string theory in the lab*, This Week's discoveries, Public Seminar Leiden Faculty of Science, 19 March 2013.

- Schalm, K.E., New challenges for early universe cosmologists, Workshop Lorentz Center Leiden (co-organizer), the Netherlands, 5-9 August 2013.

- Schoutens, K., *Quantumwereld*, Lezingen tijdens Nationale Comenius-leergangen, the Netherlands, 23 May and 19 September 2013.


- ’t Hooft, G., *Het Higgs boson*, Universiteitsdag voor alumni van de Utrechtse Universiteit, Lezing, 6 April 2013, Utrecht, the Netherlands.


- ’t Hooft, G., *The Higgs particle*, Utrecht Summerschool, the Netherlands, 21 August 2013.


- ’t Hooft, G., *Van Higgsdeeltje naar de kolonisatie van Mars*, Heerensocieteit Veere, the Netherlands, 7 November 2013.


- van Roij, R.H.H.G., *Colloidal self-assembly in liquids*, Lunch Talk, Summer School Theoretical Physics, Utrecht, the Netherlands, 29 August 2013.
- Verlinde, E.P., *Planck and the perfect echo of the big bang*, Public Debate, World Science Festival Amsterdam, the Netherlands, 5 October 2013.
- Vitelli, V., *Shocks and failure in fragile matter*, German Aerospace Center, Koln, Germany, 2 April 2013.
- Vitelli, V., *Shocks and failure in fragile matter*, Institut des Mat'eriaux, EPFL, Lausanne, Switzerland, 18 September 2013.
- Vonk, M., *Quantumfysica en elementaire deeltjes*, Popular science talk for high school students, preparation for a CERN trip, Amsterdam, the Netherlands, 23 April 2013.
- Vonk, M., *Dark matter*, Popular science talk for children, Ommel, the Netherlands, 13 July 2013.
- Zaanen, J., *From strange metals to black holes*, Symposium, Recent Electronic-Structure Theories and Related Experiments, Max-Planck-Institut, Stuttgart, Germany, 12-14 June 2013.

### 8.3 Other contributions

- Bais, F.A., De verbeelding van Bais, Interview Folia, Amsterdam, the Netherlands, 14 October 2013 (Issue: Folia 37).
- Bais, F.A., Acceptance of Freya Award, Ceremony Talk, Haarlem, the Netherlands, 7 November 2013.
- Bais, F.A., Jury president Very Short Introduction competition (Spui 25), Amsterdam, the Netherlands, 29 November 2013.
- Bertone, G.F., Interview for popular science magazine New Scientist, Amsterdam, the Netherlands September 2013.
- Bertone, G.F., Round table speaker at World Science Festival, Amsterdam, the Netherlands, October 2013.
- Kleiss, R., Moderatie Science Cafe Nijmegen, 11 March 2013, 10 June 2013, 18 November 2013.
- Laenen, E.L.M.P., Interview in DUB (Utrecht University online magazine), regarding theatershow Higgs, by Jan van den Bergh, 26 November 2013.
- ’t Hooft, G., Interview Marit van Kooij, Buitenhof, the Netherlands, 5 January 2013.
- ’t Hooft, G., Interview with Pauw and Witteman TV, 5 February 2013.
- ’t Hooft, G., Interview, Belgium TV about Mars-One (RTBF Rubrique Science-santé), 20 February 2013.
- ’t Hooft, G., Grieks TV Interview, over "Mars One", Amersfoort, 3 June 2013.
- ‘t Hooft, G., Mars One Interview, Al Jazeera Network, 10 July 2013, Amsterdam, the Netherlands.
- ’t Hooft, G., Interview, Robert Dulmers, De Groene Amsterdammer, the Netherlands, 7 August 2013.
- ’t Hooft, G., De unificatie van krachten en deeltjes, Lezing over de Nobelprijs 1999, Interview met Laura Mol, programmamaker Studium Generale, Utrecht University, the Netherlands, 25 September 2013.
- ’t Hooft, G., Interview over Universiteitshoogleraarschap, Mevr. Pleeging Utrecht, the Netherlands, 22 October 2013.
- ’t Hooft, G., Interview over Mars One met Olga Leever, 31 October 2013.
- ‘t Hooft, G., Opnamen voor videopromotiefilmpje over Mars One, Amersfoort, 11 November 2013.
- ’t Hooft, G., Interview, Upcoming Book on Mars One, Josh Richards, University of Twente, the Netherlands, 18 November 2013.
- ’t Hooft, G., Interview met Turkse krant Hurriyet over Mars One, 26 November 2013.
- van der Schaar, J.P., Black holes and the information paradox, KIJK Live!, Amsterdam, the Netherlands, 5 November 2013.
- Vandoren, S.J.G., De dimensie tijd, Labyrinth Radio (VPRO/NTR) Program about Time, Ned2, the Netherlands, 8 December 2013.
- Verlinde, E.P., Over het heelal en wat daar niet aan klopt, De Wereld Leert Door (DWLD), Amsterdam, the Netherlands, 25 March 2013.
Below an overview is presented of funding organizations that financially supported the research of the DRSTP in 2013. Regular university funding is not listed.

9.1 Personal grants

University grants
- GRavitation and AstroParticle Physics Amsterdam (GRAPPA) UvA
- University Research Fellow, S. Cotogno (VUA) (2013-2014)
- The phases of gauge theories with many flavours, NCF-grant for computing time (E. Pallante) (RUG)
- De Sitter-leerstoel, E.A. Bergshoeff (RUG) (2009-...)
- Tenure Track, D. Roest (RUG) (2011-2016)

KNAW
- Academy professorship, E.A. Bergshoeff (RUG) (2010-2015)

NWO
- NWO Spinoza grant (2006) J. Zaanen (UL)
- Veni grant (2009) N. Banerjee (UU) (2010-2013)
- Veni grant (2009) S. Miao (UU) (2010-2013)
- Vidi grant (2011) A. Parnachev (UL) (2011-2016)
- Spinoza grant (2011) E.P. Verlinde (UvA)
ERC
- ERC Synergy grant, C.W.J. Beenakker (UL) with L.P. Kouwenhoven (TU Delft) and L.M.K. Vandersypen (TU Delft) Quantum computing laboratory (QCLab).
- ERC Starting grant, G. Bertone (UvA) The moment of truth for WIMP dark matter (2011-2016)
- ERC Advanced investigator grant, B. de Wit (UU/Nikhef) Supersymmetry: a window to non-perturbative physics (2010-2015)
- ERC Starting grant, R.A. Duine (UU), New frontiers in spintronics (2008-2013)
- ERC Advanced investigator grant, P.J.G. Mulders (VUA) Quantum chromodynamics at work (2012-2017)
- ERC Advanced investigator grant, E.P. Verlinde (UvA) Emergent gravity, string theory and the holographic principle (2011-2016)

9.2 FOM funding

FOM-A-20 (group leader J. de Boer) (UvA)
A string theoretic approach to cosmology and quantum matter (FOM program 121)
09CQ01: Dynamical aspects of black holes (J. de Boer, M. Taylor, E. Verlinde)
09CQ02: Holography and cosmology (K. Skenderis, J.P. van der Schaar)
09CQ09: Programmanagement, workshops and guests (E. Verlinde)
Projectruimte
08PR2647: Topological computations for supersymmetric theories (J. de Boer)
10PR2818: An entropic view on gravity and the cosmos (E. Verlinde)

FOM-A-25 (group leader J.-S. Caux) (UvA)
Solid state quantum information processing (FOM program 73)
08QIP07: Topological quantum computation in fractional quantum Hall effect devices (C. Schoutens)
10ODE02: New linear Luttinger liquid response functions (J.-S. Caux)
11T106: Topological insulators developing a quantum field (C. Schoutens)
Projectruimte
08PR2627: A new launch pad for renormalization (J.-S. Caux)

FOM-A-32 (group leader G. Bertone) (UvA)
The missing universe: what is the subatomic constituent of dark matter (139W)
12 DM02: Dark matter theory

FOM-V-01 (group leader P. Mulders) (VUA)
Theoretical particle physics in the era of the LHC (FOM program 104)
07TPP04: Theoretical particle physics in the era of the LHC (D. Boer and P. Mulders)
07TPP04: Discrete and flavor symmetries at the LHC (P. Mulders and D. Boer)
Projectruimte
07PR2547: Color flow in hard hadronic scattering processes (P. Mulders)
12PR2986: Quantum chromodynamics at work in the Higgs sector (P. Mulders)

**FOM-V-13** (group leader F. MacKintosh) (VUA)
*Rheophysics: connecting jamming and rheology (FOM program 102)*
07CJR03: Modelling of non-affine deformations and flow (F. MacKintosh)

**Projectruimte**
07PR2680: Cell-inspired design of polymer networks with tailored mechanical properties (G.H. Koenderink and F.C. MacKintosh)
*Mechanosensing and mechanotransduction by cells (FOM program 117)*
09MMC08: Force transmission in the extracellular matrix (F. MacKintosh)
*Marginal soft matter: leveraging the mechanics of responsive networks (FOM program 143)*
12CMA04: Theory of tunable marginal networks and thermal paradox materials (F. MacKintosh)

**FOM-V-16** (group leader T.D. Visser) (VUA)
07PLSM02: Singular plasmonics (T.D. Visser)

**FOM-G-01** (group leader E. Bergshoeff) (RUG)
09PR270: Massive gravity: the road to quantum gravity? (FOM projectruimte 2009) (E. Bergshoeff)
07TPP01: CP violation with charm quarks at the LHC (FOM Programma: Theoretical particle physics in the era of the LHC) (E. Pallante)
09CQ05: Effective actions for string cosmology (FOM Programma: A string theoretic approach to cosmology and quantum matter) (E. Bergshoeff)
12PR3026: A new road to massive gravity? (Projectruimte 2012) (E.A. Bergshoeff)
09CQ06: A string theoretic approach to cosmology (D. Roest)

**FOM-L-26** (group leader H. Schiessel) (UL)
06PR2465: Statistical mechanics of semiflexible biopolymers under tension and compression
07PR2559: Putting one and one together: the physics of more than one nucleosome
11PR2854: Twisting nucleosomes and segregating chromosomes biophysics inside of the cell nucleus (B. Eslami and R. Schram)

**FOM L-07** (group leader V. Vitelli) (UL)
07CJR07: Competition of jamming and shear banding (L0717M - N. Upadhyaya)
10PR2807-1: From soft matter to dark matter: the statistical physics of lensing (L0719M - V. Koning)
10PR2807-1: From soft matter to dark matter: the statistical physics of lensing (L0719G)
12CMA05: Nonlinear effect in driven networks (L0702M)

**FOM-L-15** (group leader J. Zaanen) (UL)
FOM programma: Many body interactions and long range ordered phases at oxide hetero-interfaces
08IP04: Inter-phase - New electronic and magnetic states at interfaces in complex oxide heterostructures (J. Venderbosch)
Projectruimte jaarronde 2008
08PR2607: Fermionic quantum matter: cornering the devious fermion signs (M. Cubrovic)
FOM programma: A string theoretic approach to cosmology and quantum matter
09CQ08: Fermions and AdS/CFT (A. Bagrov)
FOM programma: Projectruimte jaarronde 2010
10PR2759: Fermionic quantum criticality and anti-de-sitter theory: black-hole answers for condensed matter questions (Y. Liu, Y.-W. Sun)
FOM programma: Topological insulators
11TI05: Theory of topological defects in 2D and 3D TI's (R.-J. Slager)
FOM programma: Projectruimte jaarronde 2012
12PR2960: Gravity at a Kelvin: the generalized rigidity of the superconducting quantum nematicm (K. Wu)

**FOM-N-26** (group leader R. Loll) (RU)
Projectruimte
08PR2578: A reality check for quantum cosmology (R. Loll)
10PR2765: Ironing out the quantum wrinkles of spacetime (R. Loll)
12PR3006: Dynamical dimensions in quantum gravity (R. Loll)

**FOM-U-35** (group leader R. Loll) (RU)
Projectruimte
08PR2578: A reality check for quantum cosmology (R. Loll)
10PR2765: Ironing out the quantum wrinkles of spacetime (R. Loll)

**FOM-U-01** (group leader G. 't Hooft) (UU)
Theoretical particle physics in the era of the LHC (FOM program 104)
07TPP03: Naturalness and fundamental vs composite scalars (G. 't Hooft)
Projectruimte
09PR2744: The 4D/5D connection for black holes and black rings (G. 't Hooft)

**FOM-U-05** (group leader H. Stoof) (UU)
Projectruimte
08PR2587: Ultracold Fermi gases and neutron stars (H. Stoof)
10PR2783-2: Spin drag in Bose gases (H. Stoof/R. Duine/P. van der Straten)

**FOM-U-29** (group leader B. de Wit) (UU)
A string theoretic approach to cosmology and quantum matter (FOM program 121)
09CQ03: Fixed point CFT’s for condensed matter systems (S. Vandoren)
09CQ04: Moduli stabilization and cosmological vacua (S. Vandoren)
Projectruimte
09PR2731: Statistical versus thermodynamic black hole entropy (B. de Wit)

FOM-U-31 (group leader R. van Roij) (UU)
Innovative physics for oil and gas (FOM/SHELL program 116)
08iPOG08: Electrokinetics and electroacoustics near oil-water interfaces in porous media (R. van Roij)
Projectruimte
07PR2592: Do smectic nuclei exist? (R. van Roij and M. Dijkstra)

FOM-U-34 (group leader R. Duine) (UU)
Controlling spin dynamics in magnetic nanostructures: combining fast time and short length scales for tomorrow’s technology (FOM program 109)
80SPIN03: Theory domain walls (R. Duine)

9.3 FOM-Nikhef

FOM programme (group leader E. Laenen)
Theoretical Particle physics in the era of the LHC (FOM programme 104)
07TPP06: Tools, methods and applications for new physics predictions for the LHC (J.W. van Holten, E. Laenen, J. Vermaseren)

FOM programme (group leader E. Verlinde)
String theory and quantum gravity (FOM programme 57)
01STGQG04: Conformal field theory (A. Schellekens)

FOM program (group leader J. van den Brand)
String theory and quantum gravity (FOM program 57)
01STGQG04: Conformal field theory (J.-W. van Holten)

FOM-Nikhef (group leader J. Vermaseren)
Projectruimte
07PR2556: Precision phenomenology at the LHC (J. Vermaseren)

FOM-Nikhef (group leader A. Schellekens)
Projectruimte
05PR2435: Standard model interactions from open string theory (A. Schellekens)

FOM-Nikhef (group leader R. Fleischer)
Projectruimte
05PR2435:
9.4 EU-networks

Study of Strongly Interacting Matter (HadronPhysics3)
Duration: 2012-2014
Netwerk coordinator: C. Guaraldo (Frascati)
Scientist in charge for VUA: P.J.G. Mulders

LHCPhenoNet (Contract nr. PITN-GA-2010-264564)
Duration: from 01-01-2011 until 31-12-2014
Network coordinator: Dr. G.Rodrigo (Valencia)
Scientist in charge for Nikhef: E. Laenen

9.5 Other

NWO

STW
- VTF 7803 (T. Visser) (VUA): Using light better (S. Raghunathan)

Fellowships
- A.-I. Babeanu (UL), Huygens PhD Fellowship awarded to PhD who started in September 2013
- D. Cohen, national Commissiton for Scientific and Technological Research Chile, PhD (2013-2017)
- J. de Gier (KNAW) 2013-2014
- S. Gryb (RU) NSERC Canadian Postdoc Fellowship (2011-2013)
- K. Liu (UL) China Scholarship Council (2012-2016)
- L. Pena Pires (UU/RU) Portuguese Foundation for Science and Technology, PhD Fellowship (2012-2016)
- N. Poovuttikul (UL) Institute for the Promotion of Teaching Science and Technology (IPST), DRSTP Scholarship 2008-2017

EU Marie Curie Intra-European fellowships
- P. Artoisenet (Nikhef) (2012-2014)
- W. Nelson (RU) Quantum cosmology (16 November 2012 - 16 November 2014)
- B. Vercnocke (UvA) QM-Sing (2013-2015)

Templeton project (2013) (group leader, J. Zaanen) (UL)
- J. de Gier (KNAW) (2013-2014)
- K. Schalm (UL) (2013-2016)
- J. Zaanen (UL) (2013-2016)

**EU IRSES (International Research Staff Exchange Scheme)**
- Quantum Integrability, Conformal Field Theory and Topological Quantum Computation (J.-S.Caux) (2012-2016)

Boyarsky, A. (UL)
Sinergia grants from Swiss Science Foundation. 1 postdoc, is funded by that project
In Switzerland, project leader. Collaboration with Diego Garlaschelli.

Garlaschelli, D. (UL)
EU Large-scale integrating project "MULTIPLEX" (Leiden node coordinated by Diego Garlaschelli), 1 PhD fellowship funded and started November 2013 (Valerio Gemmetto);

Research grant for 1 PhD received from Stichting Econophysics, PhD started in January 2013 (Assaf Almog) (UL)
10 | Organization (per 31-12-2013)

Scientific Advisory Committee:
Prof. P.M. Chaikin (NYU), New York University, USA
Prof. M. Henneaux (ULB), University of Brussels, Belgium
Prof. R. Kallosh (SU), Stanford University, California, USA
Prof. G. ’t Hooft (UU), Utrecht University, the Netherlands
Prof. X.-G. Wen (MIT), Massachusetts Institute of Technology, Cambridge, Massachusetts, USA

Scientific Director DRSTP:
Prof. G.E. Arutyunov (UU), 030-2535906, g.e.arutyunov@uu.nl

Governing Board:
Dr. W.J.P. Beenakker (RU), 024-3653283, w.beenakker@science.ru.nl
Prof. E.L.M.P. Laenen (Nikhef), 020-5925127, eric.laenen@nikhef.nl
Prof. F.C. MacKintosh (VUA), 020-5987857, fc.mackintosh@few.vu.nl
Prof. C. Morais Smith (UU), 030-2533062, c.demoraissmith@uu.nl
Prof. E. Pallante (RUG), 050-3633420, e.pallante@rug.nl
Prof. E.P. Verlinde (UvA) (Chair), 020-5257314, e.p.verlinde@uva.nl
Prof. J. Zaanen (UL), 071-5275506, jan@lorentz.leidenuniv.nl

Educational Board:
Dr. P.A. Bobbert (TUE), 040-2474352, p.a.bobbert@tue.nl
Prof. D. Boer (RUG), 050-3633656, d.boer@rug.nl
Dr. P.J.H. Denteneer (UL), 071-5275508, pjhdent@lorentz.leidenuniv.nl
M.A. Janssen MSc (UU) (representative PhD Student Council)
Prof. P.J.G. Mulders (VUA), 020-5987863, pjg.mulders@few.vu.nl
Prof. B. Nienhuis (UvA) (Chair), 020-5255749, b.nienhuis@uva.nl
Dr. F. Saueressig (RU), 024-3652826, f.saueressig@science.ru.nl
Prof. J.-W. van Holten (Nikhef), 020-5925131, t32@nikhef.nl
Dr. R.H.H.G. van Roij (UU), 030-2537579, r.vanroij@uu.nl
PhD Student Council:
G. d'Ambrosi MSc (Nikhef), 020-5925158, gdambros@nikhef.nl
M.A. Janssen MSc (UU), 030-2532955, m.a.janssen1@uu.nl
J.P. Noordmans MSc (RUG), 050-3633600, noordmans@kvi.nl
N. Pinzani Fokeeva MSc (UvA) (Chair), 020-5255768,
n.pinzanifokeeva@uva.nl
L.P. Pires MSc (RU), 024-3652209, l.pires@science.ru.nl
S.K. Saravanan MSc (UL), 020-5925132, satish@lorentz.leidenuniv.nl
A. Signori MSc (VUA), 020-5987906, a.signori@vu.nl

DRSTP Bureau:
Drs. J.M. van Zee, (Managing Director), 030-2537549, j.m.vanzee@uu.nl
W.L. Verweij, (Secretary), 030-2535916, w.l.verweij@uu.nl
11 | Partners and associate members

University of Amsterdam (UvA)
Faculty of Science
Institute for Theoretical Physics
Science Park 904, 1098 XH Amsterdam
P.O. Box 94485, 1090 GL Amsterdam
tel.: 020-5255773
fax: 020-5255778
e-mail secretariat: a.m.crommentuijn@uva.nl (Anne-Marieke Crommentuijn);
n.wells@uva.nl (Natalie Wells); website: http://iop.uva.nl/

Vrije Universiteit Amsterdam (VUA)
Faculty of Sciences
Department of Physics and Astronomy
Astro-Particle Physics
De Boelelaan 1081
1081 HV Amsterdam
tel.: 020-5987892
fax: 020-5987992
e-mail secretariat: m.e.herronen@vu.nl (Marja Herronen)

University of Groningen (RUG)
Faculty of Mathematics and Applied Sciences
Centre for Theoretical Physics
Nijenborgh 4
9747 AG Groningen
tel.: 050-3634950
fax: 050-3634947
e-mail secretariat: i.de.roo-kwant@rug.nl (Iris de Roo-Kwant);
a.m.blanksma@rug.nl (Annelien Blanksma); secrctn@rug.nl
website: http://www.rug.nl/research/centre-theoretical-physics/
Leiden University (UL)
Faculty of Mathematics and Natural Sciences
Instituut-Lorentz for Theoretical Physics
Niels Bohrweg 2
2333 CA Leiden
P.O. Box 9506
2300 RA Leiden
tel.: 071-5275505
fax: 071-5275511
e-mail secretariat: fran@lorentz.leidenuniv.nl (Fran Ouwerkerk-Persaud)
website: http://www.lorentz.leidenuniv.nl/

Radboud University Nijmegen (RU)
Faculty of Science
Theoretical Physics
Heyendaalseweg 135
6525 AJ Nijmegen
P.O. Box 9010
6500 GL Nijmegen
Institute for Mathematics, Astrophysics and Particle Physics
tel.: 024-3652098
fax: 024-3652191
e-mail secretariat: secr@hef.ru.nl (Gemma Koppers-Janssen; Annelies Oosterhof-Meij; Marjo Wees-Mobertz)
website: http://www.ru.nl/imapp/
Institute for Molecules and Materials
tel.: 024-3652981
fax: 024-3652120
e-mail secretariat: a.follings@science.ru.nl (Anja Föllings-Reuvers)
website: http://www.ru.nl/imm/

Utrecht University (UU)
Faculty of Science
Department of Physics and Astronomy
Institute for Theoretical Physics
Leuvenlaan 4
3584 CE Utrecht
P.O. Box 80.195
3508 TD Utrecht
tel.: 030-2535928
fax: 030-2535937
e-mail secretariat: science.secr.itp@uu.nl
website: http://web.science.uu.nl/itf/default.htm
**National Institute for Subatomic Physics (Nikhef)**
Nikhef Theory Group
Science Park 105
1098 XG Amsterdam
P.O. Box 41882
1009 DB Amsterdam
tel.: 020-5925127
fax: 020-5925155
e-mail secretariat: p39@nikhef.nl (Eveline Schram-Post);
eric.laenen@nikhef.nl
(Eric Laenen)

**Associate members**

Prof. H.A. de Raedt
University of Groningen
Department of Applied Physics
Materials Science Centre
Nijenborgh 4
9747 AG Groningen

Prof. H. Dekker
Science Park 904
1098 XH Amsterdam

Prof. L.-F. Feiner
Philips Research Lab
High Tech Campus 4
5656 AA Eindhoven

Dr. B.J. Hoenders
University of Groningen
Department of Applied Physics
Materials Science Centre
Nijenborgh 4
9747 AG Groningen

Dr. L.P.J. Kamp
Eindhoven University of Technology
Department of Applied Physics
Den Dolech 2
5612 AZ Eindhoven
Prof. J. Knoester  
University of Groningen  
Department of Applied Physics  
Materials Science Centre  
Nijenborgh 4  
9747 AG Groningen

Prof. D. Lohse  
University of Twente  
Faculty of Science and Technology  
Physics of Fluids  
Drienerloolaan 5  
7522 NB Enschede

Dr. M.V. Mostovoy  
University of Groningen  
Department of Applied Physics  
Materials Science Centre  
Nijenborgh 4  
9747 AG Groningen

Theoretical and Polymer Physics Group  
Eindhoven University of Technology  
Department of Applied Physics  
Research Cluster of Functional Materials  
Den Dolech 2  
5612 AZ Eindhoven  
P.O. Box 513  
5600 MB Eindhoven
Appendix A | Mission statement

Objectives
The Dutch Research School of Theoretical Physics (DRSTP) is a cooperation between the theoretical physics groups of six Dutch universities and of the National Institute for Subatomic Physics (Nikhef) with the following purpose:

- to implement a joint programme of graduate education in theoretical physics that draws upon a dynamic research environment;
- to maintain and strengthen research in theoretical physics from a broad unifying perspective that exploits the interrelationships between different fields of theory;
- to strengthen, both in research and graduate education, connections with experimental physics, and other disciplines such as mathematics, computational science, astrophysics, earth science, physical chemistry and the life sciences.

The DRSTP is based on the conviction that a joint venture of all the moderately sized local theory groups, each with its own profile, offers added value for the achievement of these objectives. The DRSTP represents a sizable part of the national activity in theoretical physics, a field that has a strong tradition in the Netherlands. At present there exists no other organization that represents this field of research at the national level. The DRSTP welcomes further growth, for instance, by cooperation with institutions in neighboring countries that share these goals. Often its educational activities already attract students from neighboring countries and occasionally some of these activities are based on a close collaboration with partners abroad.

Mandate
The Governing Board of the DRSTP, which consists of representatives of the partners, is responsible for undertaking any suitable initiative to further its goals. The scientific director of the DRSTP is responsible for implementing the overall policy on behalf of the Board and for coordinating the DRSTP activities. The mandate to carry out these tasks is based on an official agreement between the boards of the participating partners, as a result of which the DRSTP has been accredited by the Royal Netherlands Academy of Arts and Sciences (KNAW) in June of 1994 and reaccredited in 1999, 2004 and 2010. The agreement guarantees means for a six year period in terms of explicit staff commitments as well as graduate student positions. The
DRSTP is assisted in its endeavor by an international Scientific Advisory Committee of distinguished scientists.

Research
Theoretical physics is based on universal principles. New concepts often have a much wider validity than in the field in which they are discovered, and methods developed in one field are sometimes very useful in another. Hence theoretical physics is characterized by unity in diversity. The research fields of the DRSTP are highly diverse, ranging from the physics at the very smallest length scales to the large scale structure of space and time, and from the study of building blocks of matter to the intricacies of the many-body physics of condensed matter, be it quantum matter, soft matter or bio-matter. The methods employed in these various fields make up the universal language of theoretical physics: formalisms such as the renormalization group and quantum field theory, and various concepts of statistical, computational and mathematical physics are universally applied and establish cross-talk among the research fields. The research areas covered by the DRSTP can be grouped into the following broad and overlapping themes:

- Theme 1: Particle physics, cosmology, quantum gravity and string theory
- Theme 2: Quantum matter, quantum information, soft condensed matter and biophysics

The specific content of the research programme depends on the responsible project leaders, on their creativity as well as their initiative to obtain research funding from their home universities, the Dutch research councils of NWO, or from international sources such as European Union programmes. The research programme is carried out under the responsibility of the Governing Board and the scientific director in accordance with the agreement. The Governing Board of the DRSTP safeguards the objectives of the Research School. It monitors the overall coherence and quality of the research programme. The Board discusses periodically whether the program remains on the forefront of international developments. The Scientific Advisory Committee plays an essential part in these matters. The DRSTP is also accountable to the faculties of the participating partners. Therefore it reports regularly on past and planned activities, both in research and graduate education, on the basis of information presented in its yearly reports.
Graduate programme
The partners in the DRSTP offer a joint program of graduate education leading to a PhD. As part of the research training, under the supervision of a member scientist of the corresponding node, the Research School guarantees a wide range of educational opportunities for its PhD students. They consist of advanced courses, seminars and topical courses in the Netherlands, and international experience in the form of workshops, summer schools or extended research visits abroad.

The Governing Board of the DRSTP decides on admission and monitors the evaluation of progress with a prognosis of ultimate success after the first year. This takes place on the basis of an ‘Education and Supervision Form’ [opleiding- en begeleidingsplan (OBP)] between each individual PhD student and its supervisor(s), to be submitted to and approved by the Board upon admittance.

The Educational Board advises the Governing Board. It also assembles the content of the yearly programme of regular activities. Standard advanced courses are published in a nationwide survey. Special PhD courses are offered within the DRSTP, in quantum field theory, statistical physics and in theoretical condensed matter physics, or result from joint efforts with other research schools.

The input of graduate students in the school takes place in the form of a PhD Student Council that meets regularly with the scientific director and the chairman of the Governing Board and Educational Board (which also has one student member).

Individual members of the DRSTP play a pivotal role in helping to organize many summer schools and workshops, in the Netherlands as well as abroad, and in serving as teachers in all the activities that the DRSTP undertakes by itself or in cooperation with others.

Other responsibilities
The responsibilities of the DRSTP include:

- the promotion of a stimulating research environment in
- setting uniform standards of quality
- making educational supplements available tailored to individual research needs.

The Board also develops a wide range of activities in order to support an exciting research climate from fund-raising, e.g. for postdoctoral fellows, guest teachers or international mobility of DRSTP students, to the selection of visiting professors, for example on the Kramers (UU), Lorentz (UL) or Van der Waals (UvA) Chairs.
Appendix B | Selection and supervision procedure of PhD’s

When a PhD research position opens up with one of the participating partners, there is usually an open round of applications. Important criteria in the selection procedure are the potential of the student for doing independent scientific research and the level and skills demonstrated in the Master’s program.

Admission to the DRSTP requires the submission of an ‘Education and Supervision Form’ [opleiding- en begeleidingsplan (OBP)], containing a global description of educational activities with details provided for the first year. The plan also specifies how individual guidance will be provided under responsibility of the thesis advisor. The Research School safeguards a consistent implementation of the agreement, with uniform standards. The plan has to be submitted to the DRSTP Bureau. Formal admission is subject to approval by the Governing Board.

After one year the progress is evaluated, based on an interview with the thesis advisor and an independent second referee. The school safeguards this procedure without interfering with the responsibilities of the employer. Participation in the educational program is an explicit element of the evaluation: students are expected to attend at least two DRSTP postgraduate schools and the DRSTP symposium ‘Trends in Theory’. The outcome of the evaluation will reflect on whether the student will be able to complete the research program within the amount of time allotted. If the prognosis is negative, the student will be asked to leave the DRSTP. Such outcomes should be, and are, extremely rare provided proper care is given to the initial selection.

A student can appeal a negative evaluation with the Governing Board of the school; a decision will be reached within one month. If a student does leave the school before completing the PhD program, a diploma, specifying the student’s accomplishments in the educational program, will be provided.

After the first year, throughout the duration of the PhD project, the progress will be closely monitored, for example by additional yearly evaluation interviews.
Appendix C | Postgraduate courses (AIO/OIO schools)

Theoretical High Energy Physics (THEP)

Date:
11 - 22 February 2013

Location:
Hotel and conference center Landgoed Zonheuvel, Doorn, the Netherlands

Scientific organizers:
R. Kleiss (RU); D. Roest (RUG); B. Wouters (UvA)

Lecturers:
W. Beenakker (RU): *SUSY phenomenology in the era of the LHC*
R. Boels (University of Hamburg): *Scattering amplitudes: from QCD to type IIB*
R. Loll (RU): *Introduction to quantum gravity*
K. Papadodimas (RUG): *Introduction to AdS/CFT and its applications*

Evening lecturers:
B. Wemmenhove (RBS): *Physicists in the financial world*
J. van Opstal (Donders Institute, RU Nijmegen): *Optimal control of eye movements by the brain*

Twenty-six PhD students participated. All students were from the Netherlands.
On Wednesday, 20 February, a cooking workshop was organized at `Koksgasten' in Driebergen.

PhD students (26) and their presentations (25) (15 minutes each):
Atal, Vicente (UL): *Effective field theory in inflation and the imprint of massive fields check spelling*
Bonocore, Domenico (Nikhef): *Next to eikonal resummation*
Borsato, Riccardo (UU): *Integrable spin-chains and strings*
Buffing, Maarten (VUA): *Using color to zoom in on quarks and gluons in a proton*
Ciceri, Franz (Nikhef): *Towards a N=4 conformal supergravity action*
d'Ambrosi, Giuseppe (Nikhef): *Gravitational waves? Yes. neutron stars? May be.*
De Bruyn, Kristof (Nikhef): *Hunting penguins with B_s^0 → J/ψ K_s^0*
Dekens, Wouter (KVI/RUG): *Running dimension-six CP-violating operators to low energies*
de Lange, Paul (UvA): Quantum moduli space of quiver gauge theories
Gaddam, Nava (UU): Interpreting microscopic degrees of freedom of black holes
Glavan, Drazen (UU): Quantum backreaction in cosmology
Goykhman, Mikhail (UL): Holographic renormalization of the tacyon-DBI models
Ilgin, Irfan (UvA): Complementarity vs Firewall
Kovačević, Marija (RUG): New massive gravity
Lamers, Jules (UU): The Bethe/gauge correspondence
Lodato, Ivano (Nikhef): Flat directions in 5D supergravity
Mayerson, Daniel (UvA): Black holes and CFTs
Mosk, Benjamin (UvA): Causal holographic information
Pinzani Fokeeva, Natalia (UvA): Towards a general fluid/gravity correspondence
Reys, Val (Nikhef): The kinetic multiplet in N=2, d=4 supergravity
Rietkerk, Robbert (Nikhef): Spin correlations with Higgs bosons
Scalisi, Marco (RUG): Inflation in supergravity
Schlesser, Sophie (KVI/RUG): ---
Signori, Andrea (VUA): TMDs: a transverse look into hadrons
Vos, Keri (KVI/RUG): Lorentz violation in weak decays
Zojer, Thomas (RUG): Chiral gravity in three dimensions
Statistical Physics and Theory of Condensed Matter (SPTCM)

Date:
4 - 15 March 2013

Location:
Hotel and conference center Landgoed Zonheuvel, Doorn, the Netherlands

Scientific organizers:
R. Duine (UU); T. Fokkema (UvA); V. Vitelli (UL)

Lecturers:
J.-S. Caux (UvA): Introduction to conformal field theory
M. Katsnelson (RU): Topological defects in condensed matter
K. Schalm (UL): Introduction to non-perturbative phenomena in field theory, solitons and duality
G. Semerjian (ENS, Paris): Statistical mechanics of mean-field disordered systems

Evening lecturer:
D. Garlaschelli (UL): Challenges in network theory: between randomness and self-organisation

Twenty-six PhD students participated. Three students attended from the University of Antwerp.
On Wednesday, 13 March, a cooking workshop was organized at 'Koksgasten' in Driebergen.

PhD students (26) and their presentations (20) (15 minutes each):
Almog, Assaf (UL): Maximum entropy matrices: binary vs weighted properties of real financial time series
Armitaitis, Jogundas (UU): Topological Hall effect in spinor Bose gas
Beuman, Thomas (UL): The stochastic geometry of non-Gaussian fields
Bjergaard, Michael (UvA): --
Brockmann, Michael (UvA): --
de Leeuw, A.-W. (UU): Bose-Einstein condensation of photons
De Nardis, Jacopo (UvA): A critical metastable state
Di Liberto, Marco (UU): Eta-pairing superconductivity in optical lattices
Everts, Jeffrey (UU): Investigating the importance of charge regulation in charged colloidal systems
Eliëns, Sebas (UvA): --
Fokkema, Thessa (UvA): Counterpropagating one-dimensional Bose fluids
Green, Richard (UL): --
Ivashko, Artem (UL): Large-scale magnetic fields in the universe and chiral anomaly
Jacobs, Vivian (UU): A brief introduction to Weyl semimetals
Koning, Vinzenz (UL): Chiral symmetry breaking in toroidal nematic liquid crystals
Meszéna, Balazs (UL): Condensed matter applications of AdS/CFT
Moldovan, Dean (University of Antwerp): Resonant valley filtering of massive Dirac electrons
Petrovic, Marko (University of Antwerp): Spin relaxation in quantum dots with a single Mn atom
Reijnders, Koen (RU): --
Schram, Raoul (UL): The fractal globule
Slager, Robert-Jan (UL): --
Soligno, Giuseppe (UU): Computation of the minimum energy configuration of a particle at a flat interface through the triangular tessellation technique
van den Berg, Rianne (UvA): Central spin models and numerical renormalization group methods
Van Duppen, Ben (University of Antwerp): Chiral tunneling in multilayer graphene
van Heeringen, Linde (RU): The band structure of SrTiO$_3$/LaAlO$_3$ heterostructures, The k.p envelope function approach
Vlijm, Rogier (UvA): Dynamical correlation functions of higher spin chains
Appendix D | Symposium Trends in Theory

Date:
16 and 17 May 2013

Location:
Hotel Mooirivier, Dalfsen, the Netherlands

Organizers:
J.-S. Caux (UvA); E. Pallante (RUG) (DRSTP Governing Board member); L. Rademaker (UL) (PhD Student Council member); R. van Roij (UU); E. Verlinde (UvA) (Chairman DRSTP Governing Board); J. van Zee (UU) (DRSTP Managing Director)

Lecturers:
Thursday, 16 May 2013
S. Ando (UvA): Seeing dark matter disappearing: astrophysical dark matter searches
E. Bergshoeff (RUG): A new road to massive gravity
A. Turner (UvA): The entanglement spectrum of spin chains
X.-G. Wen (MIT): The world of long-range entanglement

Evening lecturer:
P. Kes (UL): Kamerlingh Onnes en de ontdekking van supergeleiding

Friday, 17 May 2014
D. Garlaschelli (UL): Jan Tinbergen’s legacy in the physics of economic networks: from gravity to quantum statistics
M. Katsnelson (RU Nijmegen): Graphene: CERN on the desk
K. Schalm (UL): Applied string theory: explaining quantum matter with black holes
R. van Roij (UU): Colloidal self-assembly in liquids

Members of the DRSTP Scientific Advisory Committee who attended were: P. Chaikin (NYU), M. Henneaux (ULB), R. Kallosh (SU), G. ’t Hooft (UU) and X.-G. Wen (MIT). Professor Wen hold a lecture during the symposium.
List of participants (125):
Achúcarro, A., prof. (UL)
Almog, A., MSc (UL)
Ando, S., dr. (UvA) (lect.)
Arutyunov, G., prof. (UU)
Atal, V., MSc (UL)
Baarsma, J., MSc (UU)
Bagrov, A., MSc (UL)
Beenaakker, C., prof. (UL)
Beenaakker, W., dr. (RU)
Benenowski, B., BSc (UL)
Bergshoeff, E., prof. (RUG) (lect.)
Beuman, T., MSc (UL)
Bezett, A., dr. (UU)
Boer, D., prof. (RUG)
Bongaarts, P., dr. (UL)
Bonocore, D., MSc (Nikhef)
Borsato, R., MSc (UU)
Boyarsky, A., dr. (UL)
Brockmann, M., dr. (UvA)
Buffing, M., MSc (VUA)
Caux, J.-S., prof. (UvA)
Chaikin, P., prof. (NYU)
Chen, B., dr. (UL)
Ciceri, F., MSc (Nikhef)
Coone, D., BSc (RUG)
D'Ambrosi, G., MSc (Nikhef)
Davison, R., dr. (UL)
de Boer, J., prof. (UvA)
de Haan, S., MSc (RUG)
Dekens, W., MSc (RUG)
de Leeuw, A.-W., MSc (UU)
De Nardis, J., MSc (UvA)
Duine, R., dr. (UU)
Eliëns, S., MSc (UvA)
Everts, J., MSc (UU)
Fioretto, D., dr. (UvA)
Flebus, B., MSc (UU)
Fleischer, R., prof. (Nikhef)
Fokkema, T., MSc (UvA)
Franse, J., MSc (UL)
Gaddam, N., MSc (UU)
Galilo, B., BSc (UvA)
Garlaschelli, D., dr. (UL) (lect.)
Glavan, D., MSc (UU)
Gneccihi, A., dr. (UU)
Gürsoy, U., dr. (UU)
Appendix D | Symposium Trends in Theory

Soligno, G., MSc (UU)
Stoof, H., prof. (UU)
‘t Hooft, G., prof. (UU)
Toldo, C., MSc (UU)
Torrado Cacho, J., MSc (UL)
Troncoso, R., dr. (UU)
Troppenz, T., MSc (UU)
Turner, A., dr. (UvA) (lect.)
Ulrich, S., dr. (UL)
Valkenburg, W., dr. (UL)
van Baal, P., prof. (UL)
van den Berg, R., MSc (UvA)
van den Broek, T., MSc (RU)
van der Bijl, E., MSc (UU)
van der Schee, W., MSc (UU)
van der Schaar, J.P., dr. (UvA)
Vandoren, S., prof. (UU)
van Heugten, J., MSc (UU)
van Holten, J.-W., prof. (Nikhef)
van Roij, R., prof. (UU) (lect.)
van Tongeren, S., MSc (UU)
Verlinde, E., prof. (UvA)
Vlijm, R., MSc (UvA)
Volponi, M., BSc (Nikhef)
Weenink, J., MSc (UU)
Wen, X.-G., prof. (MIT) (lect.)
Wiechers, M., MSc (Nikhef)
Wong, C., dr. (UU)
Wu, K., dr. (UL)
Yin, Y., MSc (RUG)
Zaanen, J., prof. (UL)
Zojer, T., MSc (RUG)

Poster presentations PhD students (62):
Andringa, Roel (RUG): A new perspective on nonrelativistic gravity
Armaitis, Jogundas (UU): Polarons in extremely imbalanced Fermi mixtures
Baarsma, Jildou (UU): Supersolid phases in imbalanced atomic Fermi gases
Beekman, Aron (UL): Type-II Josephson effect
Belli, Simone (UU): How something nasty as polydispersity stabilizes the biaxial nematic phase
Beugeling, Wouter (UU): Spin-imbalanced topological phases and chiral Rashba states in a fermionic lattice
Bosman, Sal (UvA): Half-integer Hall response in topological insulators
Budd, Timothy (UU): CDT as a candidate quantum theory of gravity, but what gravity?
Buffing, Maarten (VUA): Transverse momenta of partons and color gauge invariance
Caldeira Costa, Ricardo (UvA): Aspects of non-relativistic holography
Cubrovic, Mihailo (UL): Electron-electron and electron-hole pairing from AdS/CFT correspondence
de Adelhart Toorop, Reinier (Nikhef): Explaining fermion masses by family symmetries
De Bruyn, Kristof (Nikhef): Penguin topologies in $B^o_s \rightarrow J / \psi K_S$
Troppenz, Thomas (UU): Monte Carlo simulations of hard parallel sperocylinders in electric fields
de Lange, Paul (UvA): Strings, matrices and emergent attractive forces
de Vries, Jordy (RUG): Probing CP-violation with hadronic electric dipole moments
Den Dunnen, Wilco (VUA): Bounding W-W' mixing with spin asymmetries at RHIC
Dekens, Wouter (RUG): Consequences of A4 family symmetry in left-right models
Di Liberto, Marco (UU): Finite-momentum Bose-Einstein condensates in shaken 2D square optical lattices
Fokkema, Thessa (UU): AdS/CFT correlation functions through supergravity
Franzen, Anne (UU): Scalar waves in Kerr background
Haaker, Shanna (UvA): Particles in a perpendicular magnetic field: non-abelian gauge fields
Hetzel, Jamil (RU): Probing the supersymmetry breaking mechanism using renormalisation group invariants
Höhn, Philipp (UU): Canonical simplicial gravity
Hristov, Kiril (UU): Supersymmetric solutions in N=2 D=4 gauged supergravity
Jacobs, Vivian (UU): Kubo formalism for spin drag in an atomic Fermi gas
Jordan, Samo (UU): Phase transitions of quantum geometry
Knegjens, Rob (Nikhef): In pursuit of new physics with B mesons
Koksma, Jurjen (UU): Decoherence in quantum field theory
Koghee, Selma (UU): Merging of Dirac points in the shaken honeycomb optical lattice
Korovin, Yegor (UvA): Wilson loops at strong coupling in real-time formalism
Lodato, Ivano (UU): Effect of supersymmetric higher-derivative terms on flat directions
Lucassen, Ties (UU): Spin motive forces due to a vortex domain wall
Merkis, Wout (RUG): The AdS/ logarithmic-CFT correspondence
Mink, Martijn (UU): Probing the topological exciton condensate via Coulomb drag
Mooij, Sander (Nikhef): Goldstone bosons in Higgs inflation
Mossel, Jorn (UvA): Non-equilibrium dynamics and correlation functions of the 1D Bose gas
Niessen, Irene (RU): Supersymmetry vs extra dimensions
Noordmans, Jacob (RUG): Testing Lorentz symmetry
Nunes da Silva, Tiago (RUG): Conformality in gauge theories
Oberreuter, Johannes (UvA): Multiple problems with multiple sectors in supergravity
Ortiz, Pablo (UL): Single field inflation consistent with supergravity
Panfil, Milosz (UvA): Temperature correlations in the 1D Bose gas
Reijnders, Koen (RU): Semiclassical theory of chiral tunneling
Romers, Jesper (UvA): Charged spin textures in fractional quantum Hall states
Sfondrini, Alessandro (UU): TBA and lifting of degeneracies for AdS5 X S5 strings
Smolic, Milena (UvA): Nonconformal branes and hydrodynamics
Tieleman, Olivier (UU): s+p-orbital superfluid bosons in a 2D optical superlattice
Toldo, C. (UU): Black holes in supergravity
van de Meent, Maarten (UU): Piecewise flat gravity in 3+1 dimensions
van der Aalst, Ted (UL): Observing strings in a realistic inflationary background
van den Broek, Thijs (RU): Noncommutative geometry, a new approach to supersymmetry?
van der Bijl, Erik (UU): Spin transfer torques and spin pumping in strongly spin-orbit coupled systems
van der Schee, Wilke (UU): Gravitational dual of a lead-lead collision
van Driel, Hedwig (UU): Spin caloritronics in Bose gases
van Gelderen, Ralph (UU): Spin-density-wave instability in graphene doped near the van Hove singularity
van Heugten, Jasper (UU): Color superconductivity
van Ostaay, Jan (UL): Spin-triplet supercurrent carried by quantum Hall edge states through a Josephson junction
van Tongeren, Stijn (UU): Mirror, mirror TBA - scaling dimensions are found what way?
Weenink, Jan (UU): Gauge invariant cosmological perturbations & the quantum equivalence of frames
Wever, Chris (UU): Pair production of squarks and gluinos at hadron colliders
Zheng, Stephan (UU): New aspects of duality in topological gauge theory

A poster prize of 500 euros was awarded to first prize winner Alessandro Sfondrini (UU) for his poster entitled: The pleasure of working out things.

The jury commented:
On this colorful and playful poster the essential points of working out exact solutions of the scattering matrix of string excitations in Anti-de-Sitter (AdS) space are nicely explained and displayed. The drawings show that the problem of finding these exact solutions can be mapped onto scattering of spinwaves in a spin chain on the boundary of AdS. In a few lines an explanation is given of which technical tools are being used, namely the integrability and factorization of the 2d scattering problem using the Yang-Baxter equations. Alessandro Sfondrini has succeeded in making very clear
what his research is about, using only very few words. Alessandro indeed enjoy working things out. His title, which is a playful variation of the title of Feynman’s well known book, is therefore very well chosen. The poster was selected by a general vote, and came out clearly on top receiving a considerable fraction of the number of votes."

Alessandro Sfondrini: The pleasure of working out things, 2013
Appendix E | PhD Day

Date:
Friday, 27 September 2013

Location:
Marinus Ruppert Building, room 040, Leuvenlaan 21, Utrecht University, the Netherlands

Organizers:
Members of the DRSTP PhD Student Council

Lecturers (35 minutes each):
Giuseppe d’Ambrosi (Nikhef): *A song of waves and stars*
Wouter Dekens (RUG): *CP violation from high to low energies*
Jacopo de Nardis (UvA): *A journey into thermalization in a closed quantum system: from von Neumann to nowadays*
Ion Cosma Fulga (UL): *Topological insulators, Majorana fermions and quantum computation*
Chiara Toldo (UU): *Phase transitions of AdS4 black holes*

External speaker (former PhD student UU):
Koos Gubbels (Coöperatie VGZ, Financial Risk Officer): *Working at an insurance company*

Sixty-one students (61) attended of which forty-nine (49) were PhD students, eleven (11) were Master’s students and one (1) participant was a former PhD student of Utrecht who is now employed at Coöperatie VGZ, Nederlandse zorgverzekeraar.
### List of participants (61)

1. Armaitis, Jogundas (UU)  PhD
2. Babeanu, Alexandru (UL)  PhD
3. Betzios, Panagiotis (UU)  PhD
4. Bjerngaard, Michael (UvA)  PhD
5. Bonocore, Domenico (Nikhef)  PhD
6. Borsato, Riccardo (UU)  PhD
7. Bosetti, Paolo (VUA)  Ms
8. Buffing, Maarten (VUA)  PhD
9. Ciceri, Franz (Nikhef)  PhD
10. Cohen, Diego (UvA)  PhD
11. Cotogno, Sabrina (VUA)  Ms
12. d’Ambrosi, Giuseppe (Nikhef)  PhD/organizer/speaker
13. Dekens, Wouter (RUG)  PhD/speaker
14. de Leeuw, Arie-Willem (UU)  PhD
15. de Nardis, Jacopo (UvA)  PhD/speaker
16. Di Liberto, Marco (UU)  PhD
17. Everts, Jeffrey (UU)  PhD
18. Flebus, Benedetta (UU)  PhD
19. Fokkema, Thessa (UvA)  PhD
20. Fulga, Ion Cosma (UL)  PhD/speaker
21. Gaddam, Navaneeth (UU)  PhD
22. Grubinskas, Simonas (UU)  Ms
23. Gubbels, Koos (VGZ)  external speaker
24. Ilgin, Irfan (UvA)  PhD
25. Jacobs, Vivian (UU)  PhD
26. Jain, Sandeep Kumar (UU)  PhD
27. Kabir, Laurens (UvA)  PhD
28. Lamers, Jules (UU)  PhD
29. Licup, Albert (VUA)  PhD
30. Liu, Xuewen (UU)  Ms
31. Mayerson, Daniel (UvA)  PhD
32. Meszéna, Balázs (UL)  PhD
33. Ortiz, Pablo (UL)  PhD
34. Papadoulaki, Olga (UU)  PhD
35. Papadomanolakis, Jorgos (UvA)  Ms
36. Pinzani Fokeeva, Natalia (UvA)  PhD/organizer
37. Pires, Luis (RU)  PhD/organizer
38. Quelle, Anton (UU)  PhD
<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Affiliation</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>39.</td>
<td>Rademaker, Louk (UL)</td>
<td>PhD/organizer</td>
<td></td>
</tr>
<tr>
<td>40.</td>
<td>Reijnders, Koen (RU)</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>41.</td>
<td>Ren, M.</td>
<td>Ms</td>
<td></td>
</tr>
<tr>
<td>42.</td>
<td>Reys, Valentin (Nikhef)</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>43.</td>
<td>Rietkerk, Robbert (Nikhef)</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>44.</td>
<td>Rottier, Otto (Nikhef)</td>
<td>Ms</td>
<td></td>
</tr>
<tr>
<td>45.</td>
<td>Saravanan, Satish Kumar (UL)</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>46.</td>
<td>Signori, Andrea (VUA)</td>
<td>PhD/organizer</td>
<td></td>
</tr>
<tr>
<td>47.</td>
<td>Silverwood, Hamish (UvA)</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>48.</td>
<td>Slager, Robert-Jan (UL)</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>49.</td>
<td>Sulangi, Miguel (UL)</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>50.</td>
<td>Sybesma, Watse (UU)</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>51.</td>
<td>Toldo, Chiara (UU)</td>
<td>PhD/speaker</td>
<td></td>
</tr>
<tr>
<td>52.</td>
<td>Tompitak, Marco (UL)</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>53.</td>
<td>van den Berg, Rianne (UvA)</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>54.</td>
<td>van der Bijl, Erik (UU)</td>
<td>PhD/organizer</td>
<td></td>
</tr>
<tr>
<td>55.</td>
<td>van der Woude, Drian (UU)</td>
<td>Ms</td>
<td></td>
</tr>
<tr>
<td>56.</td>
<td>van Miert, Guido (UU)</td>
<td>Ms</td>
<td></td>
</tr>
<tr>
<td>57.</td>
<td>Vos, Keri (RUG)</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>58.</td>
<td>Weenink, Jan (UU)</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>59.</td>
<td>Welling, Yvette (UU)</td>
<td>Ms</td>
<td></td>
</tr>
<tr>
<td>60.</td>
<td>Wiechers, Michael (Nikhef)</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>61.</td>
<td>Wigbers, Manon (VUA)</td>
<td>Ms</td>
<td></td>
</tr>
</tbody>
</table>
PhD Day poster, 2013
Appendix F | National seminars

Theoretical High Energy Physics (THEP)

- **Date:**
  1 March 2013

**Location:**
Nikhef-WCW, Amsterdam, the Netherlands

**Scientific organizers:**
A. Achúcarro (UL); G. Arutyunov (UU); R. Fleischer (Nikhef)

**Lecturers:**
R. Loll (UU): *Quantum spacetime, from a practitioner’s point of view*

P. Mulders (Nikhef/VU University Amsterdam): *Beyond collinearity in high energy QCD processes*

L. Senatore (Stanford & CERN): *Effective field theory in cosmology*

S. Vandoren (Utrecht University): *New goals for black holes*

- **Date:**
  22 November 2013

**Location:**
Nikhef-WCW, Amsterdam, the Netherlands

**Scientific organizers:**
A. Achúcarro (UL); G. Arutyunov (UU); R. Fleischer (Nikhef)

**Lecturers:**
A. Boyarsky (UL): *Plan B: BSM physics without new particles at the LHC*

J. de Boer (UvA): *Entanglement in gravity*

Adam Falkowski (Orsay): *Higgs after LHC run I*

M. Heller (UvA/NCBJ Warsaw): *Gauge fields out of equilibrium - a holographic approach*
Condensed Matter Physics (CMP)

- **Date:**
  11 January 2013

- **Location:**
  FOM Institute AMOLF, Amsterdam, the Netherlands

- **Scientific organizer:**
  J.-S. Caux (UvA)

- **Lecturers:**
  Y. Blanter (TUD): *Nanomechanics: back-action, dissipation, and quantum limit*
  
  M. Mostovoy (RUG): *Topological defects in multiferroic and magnetoelectric materials*
  
  S. Otte (TUD): *Atomically assembled spin lattices*
  
  H. Zandvliet (UT): *Atomic chains*
Appendix G | Statistics

On 31 December 2013 one-hundred and thirteen (113) PhD students were affiliated to the DRSTP. In 2013 forty (40) PhD students joined the DRSTP.

Twenty-nine (29) PhD degrees were granted in 2013 (four to women (14%)). The average duration of their PhD research (from start of contract to PhD exam date) was 53,3 months (it was 52,0 in 2012).

Statistics 2007-2013
PhDs (AIO/OIO) granted
1 January 2007 - 31 December 2013
(per theme)

<table>
<thead>
<tr>
<th>Theme</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total AIO +OIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theme 1</td>
<td>7</td>
<td>8</td>
<td>10</td>
<td>11</td>
<td>8</td>
<td>13</td>
<td>16</td>
<td>73</td>
</tr>
<tr>
<td>Theme 2</td>
<td>5</td>
<td>7</td>
<td>5</td>
<td>10</td>
<td>8</td>
<td>9</td>
<td>13</td>
<td>57</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>15</td>
<td>15</td>
<td>21</td>
<td>16</td>
<td>22</td>
<td>29</td>
<td>130</td>
</tr>
</tbody>
</table>
PhD efficiency

In the period 1 January 2007 - 31 December 2013, 130 PhD degrees were granted. Of these students 72% finished their PhD research within four years and six months. The full distribution is as follows:

- within 4 years: 47 (36%)
- within 4 years and 6 months: 93 (72%)
- within 5 years: 113 (87%)
- more than 5 years: 17 (13%)

The fraction of PhD degrees granted to women in the period 1 January 2007 - 31 December 2013 is 11%.
### Employment following the PhD 2007 – 2013

<table>
<thead>
<tr>
<th>Postdoctoral positions in theoretical physics:</th>
<th>Amount</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>the Netherlands</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>EU</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Abroad elsewhere</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>76</td>
<td>62%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Positions in academia and in public (research) institutions not related to theoretical physics:</th>
<th>Amount</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical research position</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>PhD position</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Other research position</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>13</td>
<td>11%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Positions in the government and in government-related organizations:</th>
<th>Amount</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Justice</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Positions in commercial companies:</th>
<th>Amount</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>ICT companies</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Consultancy</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>28</td>
<td>23%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teaching positions:</th>
<th>Amount</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School teacher</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>5</td>
<td>4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other:</th>
<th>Amount</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subtotal</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>100%</td>
</tr>
</tbody>
</table>
