HGSFP

NEWSLETTER

Heidelberg Graduate School of Fundamental Physics

No. 9 / September 2013

Main Topics:

Editorial

With the start of the second funding phase of the HGSFP, our established schools and other events are routinely held, providing continuity into the future. At the same time, our Graduate School is growing to include other fields of physics. In particular, doctoral students doing fundamental research in mathematical, bio or environmental physics are also now admitted to the School. We are convinced that they, as well as the new staff at the junior research group level, will provide further impetus to all of our research fields and our research community. We've summarized some of the news in this letter for you.

Do remember that you are always welcome to provide contributions and give feedback to us at any time.

Sandra Klevansky, Markus Oberthaler and Rüdiger Klingeler

Students report back

■ As in previous years, 2013 kicked off with the HGSFP winter school in Obergurgl, Austria. Around forty doctoral students took part in a scientific programme that covered the main branches of the Graduate School, focussing on interdisciplinary topics. With every participant presenting his or her own work in poster sessions, lively discussions encouraged everyone to connect with people from other scientific fields. Happily, planning for next year's school is already well under way with volunteers coordinating logistics and setting up an exciting programme. We look forward to seeing you there in January 2014!

A great feature of the Graduate School is having many active and enthusiastic people willing to set up further social and sponsoring events. In February, the team "Tunnel Effect" with players from PI took home the prestigious HGSFP Soccer Cup Trophy. The biannual tournament will return in August for another round of games.

The student website (http://wiki.kip.uni-heidelberg.de/hgsfp/) has now been running for a couple of years. It provides useful information on various topics surrounding your studies and careers, but has also been continuously expanded as a tool to find conferences, schools and other related events. Documents and information from previous years are also made available for reference. The success of the website hinges on participation by its users, who can expand and improve the content where they see fit.

Further projects planned for the second half of this year include a more comprehensive assessment of student life, following on from surveys carried out in previous years and a scientific pub quiz. Suggestions and events making more use of our Graduate Lounge in INF 226 are always welcome and we are working on ways to broaden the acceptance of this space.

Lastly we again thank all those people who have initiated and coordinated activities throughout the year! Feel free to contact us with any suggestion you have (studentreps@gsfp.uni-heidelberg.de). ◀

Participants of the 6th HGSFP winter school

New directorate takes office

■ The newly elected directorate of the HGSFP, Werner Aeschbach-Hertig, Rüdiger Klingeler, Tilman Plehn and Björn Malte Schäfer join Sandra Klevansky and our student representatives Richard Hanson and Simon Murmann in office from 1st September, 2013 for a period of two years. The directorate now has, in accordance with the application for the HGSFP+, an additional member representing environmental physics, classical complex systems and mathematical physics. We congratulate Rüdiger Klingeler, who is our new spokesperson, and wish him every success in continuing to develop the HGSFP. We also thank the outgoing directors Markus Oberthaler (Spokesperson), Matthias Bartelmann and Hans-Christian Schultz-Coulon for all they have done. ◀

New junior research group leaders join the HGSFP

■ The HGSFP welcomes our new junior research group leaders:

Oleg Brandt is at the Kirchhoff Institute of Physics and is building up a research programme to search for new physics with the ATLAS detector. His main scientific focus lies in precision measurements of gauge boson pair-production at high invariant masses and a general search for new physics in multilepton final states.

Eran Palti has joined us at the Institute of Theoretical Physics. His field of expertise is in string theory phenomenology and Grand Unified Theories (»GUTs«).

Markus Müller has also joined the Institute of Theoretical Physics. His field of research, mathematical quantum information theory, lies on the boundary of quantum foundations and quantum information. He is interested in quantum information in statistical physics, generalized probabilistic theories and classical and quantum algorithmic complexity theory.

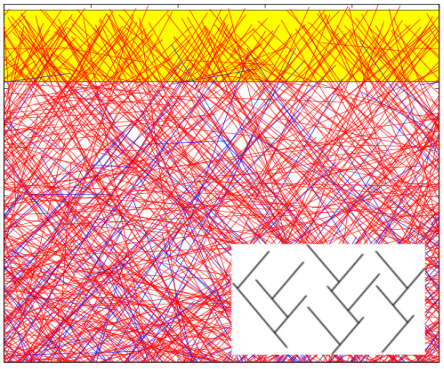
Valeria Pettorino will join the HGSFP and will also be resident at the Institute of Theoretical Physics from October 2013. She works both in the field of theoretical cosmology and in data analysis. She has been working in both of the two advanced cosmology enterprises, the Planck collaboration and more recently the Euclid Satellite collaboration.

In 2014, Tobias Kluge will join us as a junior research group leader. His interests lie broadly within the field of environmental physics focussing on the development of new isotope and geochemical tracer techniques for an in-depth analysis of various Earth systems.

In the coming issues we will profile our junior research group leaders individually. We wish them and our doctoral researchers productive years in Heidelberg. ◀

Structure model of cellular polymer networks developed

■ Together with PhD student Julian Weichsel (who now holds a Postdoc position at the University of California at Berkely, USA), Ulrich Schwarz developed a model for the structure of the rapidly growing polymer networks which biological cells use to push their envelope forward during cell migration. Using a minimal set of rules motivated by experiments, they discovered that the kinetic equations predict two fixed points with mutually exclusive stability. The corresponding phase diagram can be calculated analytically and predicts first order phase transitions as a function of the migration speed. This was the first theoretical explanation for the experimental finding of hysteresis in the force-velocity curves of growing polymer networks and migrating cells. During recent years, this work has been published in a series of papers in PNAS, Physical Review E and New Journal of Physics. The image below shows a computer simulation of one of the two predicted structures growing towards the top (the inset shows a schematic diagramme).



Computer simulation of growing polymer networks

Richard Hanson

Simon Murmann

Ulrich Schwarz

Personalia

■ In this edition of our newsletter we introduce our student representatives Richard Hanson and Simon Murmann, and profile Ulrich Schwarz, who joined us in 2009.

Richard Hanson is part of Coryn Bailer-Jones' "Gaia group" at the Max Planck Institute for Astronomy on the Königstuhl. His main focus is on developing statistical models and methods to infer the three-dimensional distribution of stars and dust in our Galaxy accurately using large astronomical datasets. Quantifying the physical parameters of stars and the surrounding interstellar medium allows us to further our knowledge of the structure and dynamics of the Milky Way, helping us to understand its evolution and properties.

Fascinated by the many secrets that few trapped atoms still hold, **Simon Murmann** joined the group of Selim Jochim at the Physikalisches Institut last year. Since then he has been working on an experiment for few-atom systems and, together with his co-workers, expanded the setup for atoms in double-well potentials. The high experimental control of this and similar experiments allows us to explore fundamental correlations and to simulate quantum systems ranging from nuclear to solid-state physics. While taking data he enjoys office gardening.We look forward to new ideas from our student representatives!

Ulrich Schwarz is one of the chairs for Statistical Physics at the ITP and works on a large range of subjects in the field of soft condensed matter and biophysics. Typical examples for soft matter systems are liquid crystals, colloids, polymers and fluid membranes. He is mainly interested in the question of how living systems make good use of the unusual material properties of soft matter (see article left).

Ulrich Schwarz studied physics at Freiburg, Baltimore and Munich before earning his PhD on the physics of fluid membranes at the Max Planck Institute of Colloids and Interfaces at Potsdam in 1998. During his two-year Postdoc at the Weizmann Institute in Israel, he moved from soft matter physics to biophysics. After leading an Emmy Noether junior research group at Potsdam and Heidelberg, he became a professor for theoretical biophysics at KIT Karlsruhe in 2008. In 2009 he moved back to Heidelberg where he joined the ITP as chair for the physics of complex systems. ◀

The »Graduate Days«

■ The autumn »Graduate Days« will take place from 7th to 11th October, 2013. As usual, one of the highlights of the »Graduate Days« is the Hans Jensen Lecture. It will be held by Gerard 't Hooft from Utrecht University on »The boundary line between quantum mechanics and classical logic«. The lecture programme this time will again contain one soft skills course together with sets of lectures on various topics in both theoretical and experimental physics.

The industry lecture will be presented by a former student of the HGSFP, Ghazal Tayebirad, who now works in Munich at the Hypo Vereinsbank.

Note that our student representatives also host a students welcome and information evening with helpful tips specially for new students. We will also host the Annual General Meeting of the HGSFP during the autumn Graduate Days. Please attend and contribute to making this a lively event. Please register on our website gsfp.physi.uni-heidelberg.de/graddays. ◀

You're welcome:

... to send us suggestions of topics which you would like to be mentioned in the next newsletter: info@gsfp.uni-heidelberg.de

Poster of the 31st Graduate Days