Dear MATH+ Community,

The end of the semester is getting closer, and most of us are looking forward to a well-deserved vacation after a very unusual semester. Looking back, one can say that it was a semester full of challenges asking for creative solutions to do a good job despite pandemic circumstances. I think we were very successful, and I would like to take the opportunity to thank everyone for the enormous efforts in such difficult times.

Concerning MATH+, the next event we are looking forward to are the Cluster Days from 21-23 September. At the moment, we are planning to arrange the presentations of the project proposals via video conferencing. Please find more information below.

The MATH+ Day on 6 November will be another highlight at the end of the year. Please keep in mind that there will be elections for the Chair and Executive Board.

If you have any interesting news that you wish to share regarding your research, publications, prizes, interesting guests, the other MATH+ communication formats, or the next newsletter, please contact Beate Rogler at the MATH+ Office with further information: <rogler@mathplus.de>.

And finally, I wish everyone a nice summer and enough time for a good rest. Please be careful and stay healthy!

We are looking forward to seeing you all again soon, at least virtually!

Martin Skutella
ZIB Researchers Help to Understand Cellular Processes Related to Pain Relief Drugs. Results Published in *Nature Chemical Biology*

Pain relief therapy is one of the most important sectors of the health care system with 12-15 million patients with chronic pain, including 5 million with severe pain in Germany alone. Opioid receptors play a major role in the treatment of severe pain: world-wide more than 100 million patients use drugs based on opioid ligands (like Tramadol or Fentanyl), despite their severe side effects. These numbers are growing. Thus, a better understanding of the biomedical function of the opioid receptor system is of high relevance to society and to millions of patients hoping for relief.

In a research article published by Nature Chemical Biology, an interdisciplinary team of experimentalists and mathematicians from Berlin University Hospital Charité, the Max-Delbrück Center for Molecular Medicine, Freie Universität Berlin and ZIB show that single-molecule microscopy combined with super-resolution techniques on intact cells and advanced mathematical modelling allows to understand how dimer formation of mu-opioid receptors is influenced by specific agonists. The results suggest a new level of GPCR regulation that links dimer formation to specific agonists and their downstream signals, thus opening a path to new pain relief drugs.

*Read more (ZIB website)*
*Read more (article in *Nature Chemical Biology*)*

Publication of MATH+ EF4-4 Project in *Communication Physics (Nature Research)*: Insight into the Origin of Friction in Liquids from Combining Supercomputing and Mathematics

Friction describes how a body that is immersed in a fluid resists to dragging it. The friction experienced by the molecules of a liquid is a crucial parameter: it controls energy dissipation and sets the time scale of virtually all processes in liquid matter; examples range from viscous Stokes flow to macromolecular transition rates. On the other hand, the forces between individual molecules and atoms lead to motion that is free of dissipation. The origin of friction from such conservative forces remains as one of the grand challenges of the physics of fluids.

The bridge between these atomistic and hydrodynamic pictures of the same liquid was found by researchers of the MATH+ project EF4-4 and the Collaborative Research Center SFB 1114 at Freie Universität Berlin. The team of theoretical physicists combined high-performance simulations with mathematics and reports in the journal *Communications Physics* (Nature Publishing, DOI: 10.1038/s42005-020-0389-0) on precise dissipation spectra, which reveal that friction in liquids emerges abruptly below a certain frequency. Above this frequency, viscous liquids appear as non-dissipative, elastic solids. The rapid onset occurs in the terahertz regime and implies that the effective Brownian forces on the molecules are pronouncedly non-Markovian. The researchers plan to employ their approach to other problems where memory effects are relevant, for example cell migration and the intriguing mechanical properties of soft materials.

*Read more (article)*
*Read more (Website of the research group at FU Berlin)*
Appointments

BMS Alumnus Max Klimm Appointed Junior Professor at TU Berlin

Since July 2020, Max Klimm is a tenure-track assistant professor for Discrete Optimization at TU Berlin. His current research interests are in the fields of algorithmic game theory, discrete optimization, efficient algorithms, operations research, and mechanism design.

He received his PhD in mathematics from TU Berlin in 2012 as a member of the Berlin Mathematical School (BMS). From 2012 to 2014, he had a postdoc position at TU Berlin and from 2014 to 2016 he lead the ECMath Junior Research Group "Optimization under uncertainty" at TU Berlin.

Afterwards, Max Klimm accepted the position as a tenure-track assistant professor for Operations Research at the School of Business and Economics at Humboldt-Universität zu Berlin and became a PI of MATH+.

MATH+ Faculty Member Nadja Klein New Member of Die Junge Akademie

On 03 July, ten new members were officially appointed to Die Junge Akademie for the first time during a hybrid digital plenum. Among the new members is Nadja Klein who is leading the Emmy Noether Research Group “Regression Models Beyond the Mean – A Bayesian Approach to Machine Learning” at the School of Business and Economics of HU Berlin.

Die Junge Akademie was founded in 2000 as a joint project of the Berlin-Brandenburg Academy of Sciences and Humanities and the German National Academy of Sciences Leopoldina. Since then, it has become a role model and example for similar initiatives in many other countries. It is the first academy of young academics worldwide. It provides interdisciplinary and socially relevant spaces for outstanding young academics from German-speaking countries.

Read more (Website Die Junge Akademie) / Read more (Website Nadja Klein, HU)

Extension of John Henry Maddocks’ Einstein Visiting Fellowship at FU Berlin

We are glad to announce that the Einstein Visiting Fellowship of Prof. John Henry Maddocks was successfully extended at the request of the Berlin Mathematical School and Prof. Dr. Christof Schütte. Congratulations!

John Maddocks started his fellowship at Freie Universität Berlin in 2018. He is a prominent expert in the multiscale modeling of DNA, the nucleic acid-based biological molecule that carries genetic information.

Read more (Website Einstein Foundation)
Awards

The Following BMS-Students Have Successfully Completed Their Doctorates

Robert Löwe (HU Berlin):
“Triangulations, Discriminants and Teichmüller Theory”

Carlos Echeverria Serur (TU Berlin):
"Iterative Solution of Discretized Convection-Diffusion Problems"

Congratulations!

MATH+ Events

Preview

MATH+ Cluster Days: 21-23 September 2020

- 21 and 22 September: Presentations of the new project proposals
- 23 September: Meeting of the Research Project Committee

How will the event be organized in times of the Corona pandemic?

- The presentations of the project proposals will be given via Zoom.
- Proposals in the Application Areas will be asked to present on Monday 21 September.
- Proposals in the Emerging Fields and Transfer Unit on Tuesday 22 September.
- Sessions for each area will have a moderator in charge, who will co-ordinate the questions from the auditorium. The moderator will be assisted by a second person in charge of the technical details in Zoom.
- Slides for the presentations need to be submitted by 11 September.
- Applicants will receive an email with the time of their individual slot and additional details in the next few days.

MATH+ Day: 6 November 2020

Like last year, the MATH+ Day will begin with the meeting of the General Assembly, which will elect the Chair and Executive Board for the next two years. We plan to have presentations of the projects that will expire at the end of the year together with poster presentations of current projects. However, it is not yet clear in what format we will or can realize this.