

# MOLECULAR MATERIALS

## FROM FUNDAMENTALS TO APPLICATIONS



From 9 - 13 February, 2015 Novosibirsk State University, Russian Federation, played host to a delegation of ~40 prestigious young scientists from the UK and Russia, along with five of the world's leading academics in solid state sciences, Profs. Joel Bernstein (New York University Abu Dhabi & Shanghai), Elena Boldyreva (Novosibirsk State University and Institute of Solid State Chemistry and Mechanochemistry SB RAS), Bill Jones (University of Cambridge), Sarah Price (University College London), and Colin Pulham (University of Edinburgh). Supported by the British Council Researcher Links programme and the Royal Society of Chemistry, this meeting offered an opportunity for early career researchers to network with their peers and seek advice from their more experienced colleagues. Molecular materials were selected as the topic of the workshop as it is one of the most vibrant and fascinating fields in modern solid-state science. Current challenges in this field require the unified efforts of chemists, crystallographers, physicists and engineers, with applications spanning many industries, including pharmacy, biology and medicine.

A crucial element of the meeting was the diverse mix of cultural and scientific events. This facilitated meaningful discussions in both social and academic settings. The meeting began the evening of arrival with a beautiful display of traditional Russian dance at the House of



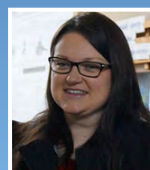
"The content was excellent and prompted very interesting conversation" - Dr. Steven Hunter (University of Edinburgh)



"A marvelous visit with perfect science and great company. I learned a lot!" - Prof. Bill Jones (University of Cambridge)



"A very memorable visit - great science, company and a chance to experience Siberia!" - Prof. Sally Price (University College London)



"A wonderful trip - great science, beautiful scenery and an exciting opportunity to meet so many inspiring scientists!" - Dr. Helena Shepherd (University of Bath)

Scientists in Akademgorodok, performed by the Krasnoyarsk National Dance Company of Siberia. This taste of Russia lit the fire of enthusiasm and excitement that was so potent throughout the week. A splendid combination of lyrics and vitality, real acrobatics and an infinite variety of "self-assembling" and "rearrangements" were a fantastic introduction to the scientific program of the meeting.



(Left) Krasnoyarsk National Dance Company of Siberia

The scientific programme started on Monday, early in the morning, and all participants were determined to work, despite the 6 hours jet lag for those from the UK. An icebreaker "speed dating" event had each participant presenting themselves in three memorable phrases to each other, changing pairs every few minutes in a manner resembling the previous night's folk dances. Following this activity, delegates were completely awake and already excited to begin scientific and collaborative discussions about their own work, seeking guidance and advice from their peers and senior colleagues. These discussions continued as the top-tier facilities housed at Novosibirsk State University were toured. The scientific programme then hit off with a keynote lecture from Prof. Bill Jones. During this stimulating presentation, delegates were

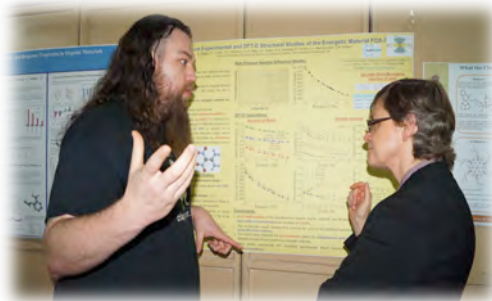
offered a taste of a broad range of topics regarding organic solids and their reactivity. Prof. Sarah Price then turned the tables with a second keynote lecture on the methods and applications of crystal structure prediction. A third keynote lecture by Prof. Joel Bernstein on the existence and nature of polymorphism in organic solids closed the formalities of the final day. This lecture was ripe with stories of Prof. Bernstein's considerable experience conducting science across the globe, from the USA to Israel and more recently to Shanghai, amongst others. A particularly intriguing aspect for the young researchers were the anecdotes Bernstein shared of his experiences applying his considerable scientific expertise to patent litigation. The theme of collaboration and networking continued into the evening with a young researchers poster session.

The cold Siberian morning of the following day started on a warm footing with an enlightening lecture on thermal analytical techniques by Prof. Valeri Drebushchak. The scientific thermostat was quickly elevated with the next keynote lecture on energetic materials by Prof. Colin Pulham. The earlier career researchers were then given a turn to present their own work to colleagues, receiving feedback and discussion from a truly diverse range of scientists. These sessions were invaluable to the younger

Ice breaker "speed dating"



Dr. Steven Hunter and Prof. Sally Price



Young researchers from Ural Federal University explaining their work to Prof. Colin Pulham and Dr. Boris Zakharov.



Prof. Colin Pulham presenting a lecture on energetic materials





*(Left) Prof. Joel Bernstein deep in scientific discussion.*

researchers and discussions “inspired to do better science in the future”, retells Dr. Saleesh Sivaraman (York). Elena Boldyreva then closed the day’s scientific discussions with a captivating discussion on applications of mechanochemistry to organic and pharmaceutical solids.

Delegates were led that evening to the local Eureka! scientific café for an open debate on “popularization of science”. Prof. Colin Pulham, a renowned advocate of public engagement with science, went to bat with the Russian guest scientists, undoubtedly convincing the audience of the importance of engaging the public in research activities. This was an enlightening activity that provoked much discussion amongst delegates.



*(Below) Prof. Colin Pulham debating public engagement with science at Nikuda’s Eureka! Science café.*

One of the most memorable events for Dr. Gary Nichol (Edinburgh) was the next morning’s excursion to the frozen Ob Sea where participants were led through the snowy Siberian forest to, and onto, the frozen sea; an experience unimaginable by many of the international delegates! Delegates were then taken to warm up whilst enjoying a local Lituianian and Ukranian art exhibition hosted by the House of Scientists. And of course, the morning was not complete without a visit to Akademgorodok’s ice slide – even the meeting’s organiser could not resist!



*(Top) Prof. Colin Pulham preparing to take a swim in the ice hole (Right).*





*Delegates enjoying a sunny day at the beach!*



*Prof. Colin Pulham and Dr. Gareth Lloyd sunbathing on the frozen lake.*



*Delegates must leave the sunny beach behind...*



*Prof. Colin Pulham and Prof. Elena Boldyreva enjoying Akademgorodok's ice slide.*



With their exercise and cultural education complete for the day, delegates returned to scientific discussion. Remaining participants were provided an opportunity to present their research, accompanied by invigorating discussion that led into the second poster session that evening. As Dr. Thomas McGlone (Strathclyde) recalls, however, this was an abnormally “effective” poster session. Having been set the task to establish, design and present an international research proposal pitch the following morning, delegates scoured the session for new colleagues, diving in and out of discussions on intertwine their skills with those of colleagues they had met only days before.



*On tour through Akademgorodok*



*Prof. Colin Pulham and Prof. Sally Price conquering the Siberian weather*



*Dr. Karen Robertson and Dr. Pavel Zelenovsky enjoying a local art exhibition.*

The next morning delegates anxiously worked in their new teams to prepare their pitches for the five scientific “dragons” – well-experienced proposal judges. As the clock struck 11 and the judges entered the pitches began. Proposals ranged from fundamental mechanochemical investigations to continuous polymorph

control to novel electronic materials for athletic footwear, demonstrating the truly diverse nature of scientists collected for this meeting. Following announcement of the successful applications – along with a peer-selected list of funded proposals – the judges shared invaluable insight into proposal preparation and the related process. This innovative exercise was the highlight scientific event for many: “The aspect I valued most from the workshop was the experience and excellent feedback we received when making a pitch”, recalls Dr. Deborah Crawford (Belfast), and



*Young researchers presenting their international collaboration pitches.*



With formal scientific discussions finished for the week, delegates spent their final afternoon exploring more of the culture Akademgorodok had to offer. On the theme of links and connections, delegates received a tour of the local train museum, learning the history of the creation and use one of the world's longest train routes. Some delegates even got to experience the comforts of the prison car in winter! The solid foundation formed between delegates over the week was then highlighted by a trip to Siberia's largest mineralogical museum, where delegates received many tales on the beautiful (and in many case mysterious) materials found throughout the region and beyond.



*Prof. Colin Pulham and Prof. Bill Jones at Novosibirsk's train museum.*



*Prof. Joel Bernstein ready for the cold at Novosibirsk's train museum.*

*(Left) Delegates enjoying a tour of historical Russian trains at the local train museum.*

The meeting closed with a farewell gala, expertly combining cultural experiences with common scientific themes of the workshop. As delegates learned traditional Russian games and dances, they reminisced on the complexities of self-organisation of molecular materials and the difficulty of blindly finding your "crystallisation" partner with a blindfolded game of "Masha, where are you?" The UK delegates quickly reciprocated the cultural dances with their own beloved ceilidh dances, solidifying the new friendships and scientific connections made throughout the week. "The final evening with traditional dancing was really nice and an interesting way to compare and contrast cultures," says Dr. Anthony Reilly (CCDC).



*Delegates enjoying traditional Russian dancing at the farewell gala.*





*Prof. Sally Price and British Council representative Igor Isakov enjoying traditional Scottish dancing!*



*Prof. Bill Jones and Prof. Elena Boldyreva give Scottish ceilidh dancing a swing!*

"The workshop surpassed my expectations on account of the tremendous enthusiasm and level of engagement of the early-career researchers. What a talented group of young people!" - says Prof. Colin Pulham, co-organiser of the workshop. "I left the workshop feeling inspired, but also a little sad at leaving Siberia and this wonderful group of new friends and colleagues."

"The idea and execution of this forum was brilliant," states Prof. Joel Bernstein, continuing that "great science was being discussed [with] a talented and enthusiastic group of young scientists."

These sentiments were echoed time and again by delegates on both the Russian and UK sides.

"The programme was interesting and active [with opportunities] for everyone to communicate with the most advanced scientists in the field of molecular materials," commented Mr. Denis Rychkov (Novosibirsk) and the "mix of formal and informal [events] ensured a well-rounded meeting, [creating] a good basis for future, tangible interactions," continues Dr. Thomas McGlone. Many, including Dr. Lynne Thomas (Bath), were very pleased by the "opportunity to meet people and build connections with Russian institutions."

"I am very happy that the event which Colin and myself have planned long ago eventually became reality. I am glad that participants are satisfied, and I look forward many new links and collaborations. We welcome anyone here in Siberia and would be happy to host young and eminent scientists also for more prolonged research visits" - says Prof. Elena Boldyreva.



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## List of Participants:

Sergey Arkhipov (Institute of Solid State Chemistry and Mechanochemistry SB RAS, Novosibirsk; Novosibirsk State University)

Alina Beloborodova (Novosibirsk State University)

Kreso Bucar (University College London)

Deborah Crawford (Queen's University Belfast)

Amit Delori (University of Strathclyde)

Liza Derevyanikova (Novosibirsk State University)

Steven Hunter (University of Edinburgh)

Germanas Kakliuganas (University of Edinburgh)

Saleesh Kumar (University of York)

Gareth Lloyd (Heriot-Watt University)

Eugene Losev (Institute of Solid State Chemistry and Mechanochemistry, SB RAS, Novosibirsk)

Thomas McGlone (University of Strathclyde)

Adam Michalchuk (University of Edinburgh; Novosibirsk State University)

Vasily Minkov (Institute of Solid State Chemistry and Mechanochemistry, SB RAS, Novosibirsk)

Gary Nichol (University of Edinburgh)

Fedor Noskov (Siberian Federal University, Krasnoyarsk)

Alla Nuraeva (Ural Federal University, Ekaterinbourg)

Vitaly Porsev (Physical Technical Institute UrO RAS, Izhevsk)

Anthony Reilly (Cambridge Crystallographic Data Centre)

Karen Robertson (University of Bath)

Denis Rychkov (Institute of Solid State Chemistry and Mechanochemistry, SB RAS; Novosibirsk State University)

Helena Shepherd (University of Bath)

Lynn Thomas (University of Bath)

Sarah Thomas (University of Edinburgh)

Ivan Tumanov (Novosibirsk State University)

Mikhail Uvarov (Institute of Chemical Kinetics SB RAS, Novosibirsk, Novosibirsk)

