

Sergey N. Semenov (Born: 20 June 1984)

Department of Organic Chemistry
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Education

- Harvard University 2014 – 2017
Postdoctoral Fellow
- Radboud University of Nijmegen, The Netherlands 2010 – 2014
Postdoctoral Fellow
- University of Zurich, Switzerland 2006 – 2010
Ph.D., Chemistry (with honors, top 5%)
- Moscow State University, Russia 2001 – 2006
M.S., Chemistry (with honors)

Research Interests

Autocatalysis, Chemical Networks, Nanotechnology, Biophysics, Soft-Matter, Catalysis, Organometallic Chemistry, Systems Chemistry, Molecular Electronics

Research Experience

- Assistant Professor (Senior Scientist) Jan 2018 – Present
Weizmann Institute of Science
Department of Organic Chemistry
- Postdoctoral Fellow, Harvard University Sep 2014 – Dec 2017
Department of Chemistry and Chemical Biology
Advisor: George M. Whitesides
Physical-Organic Chemistry, Chemical Reaction Networks, Origin of Life, Complexity
- Marie Curie Fellow, Radboud University of Nijmegen May 2012 – Apr 2014
Institute of Molecules and Materials
Advisor: Wilhelm T.S. Huck
Key publication: Semenov, S. N. et al. Rational design of functional and tunable oscillating enzymatic networks. *Nature Chemistry* (2015), 7, 160-165.
- Postdoctoral Fellow, Radboud University of Nijmegen Oct 2010 – May 2012
Institute of Molecules and Materials
Advisor: Wilhelm T.S. Huck
Reaction-Diffusion Networks, Soft-Matter, Biophysics
- Ph.D. Student, University of Zurich Sep 2006 – Sep 2010
Chemistry Department
Advisor: Heinz Berke

Ph.D. thesis: “Development of Conjugated Mono- and Polynuclear Tungsten Organometallic Complexes for Potential Application in Molecular Electronics”

- Master’s Student, Moscow State University Sep 2003 – June 2006
Department of Chemistry
Advisor: Andrey Drozdov
Master thesis: “Terbium and Europium Complexes with New 4-acylpyrazolones: Synthesis, Structure, and Luminescent Properties.”

Awards and Scholarships

- Marie Curie Intra-European Fellowship (Grant 300519, ~200000 €) 2012
- Auszeichnung from University of Zurich 2010
- SCNAT/SCS Chemistry Travel Award 2010
- Forschungskredit research grant from University of Zürich (~50000 CHF) 2008
- Grant for talented students and young scientists of Moscow State University 2006
- Third award at Samsung idea contest 2005

Invited Talks

- Keynote speaker, “Oscillations in networks of organic and enzymatic reactions: towards active smart materials” 2017 International Conference on BioNano Innovation, 24-27 September, Brisbane, Australia. 2017
- Invited lecture, “Autocatalytic, bistable, oscillatory networks of biologically relevant organic reaction”, Nanyang Technological University, Singapore, 7 February 2016
- Invited lecture, “Autocatalytic, bistable, oscillatory networks of biologically relevant organic reaction”, Institute of Organic Chemistry, Russia Academy of Science, Moscow, Russia, 26 December 2016

Publications

ResearchGate https://www.researchgate.net/profile/Sergey_Semenov
Google Scholar <https://scholar.google.com/citations?user=e7uZBT0AAAAJ&hl=en>
ResearcherID <http://www.researcherid.com/rid/A-2322-2015>

Published and accepted manuscripts

1. Shencheng Ge, **Sergey N. Semenov**, Amit A. Nagarkar, Jonathan Milette, Dionysios C. Christodouleas, Li Yuan, George M. Whitesides “Magnetic Levitation To Characterize the Kinetics of Free-Radical Polymerization” // *J. Am. Chem. Soc.*, (2017), *139*, 18688 – 18697.
2. **Sergey N. Semenov**, Lewis J. Kraft, Alar Ainla, Mengxia Zhao, Mostafa Baghbanzadeh, Victoria E. Campbell, Kyungtae Kang, Jerome M. Fox, George M. Whitesides “Autocatalytic, Bistable, Oscillatory Networks of Biologically Relevant Organic Reaction” // *Nature*, (2016), *537*, 656 – 660.
3. Carleen M. Bowers, Dmitriy Rappoport, Mostafa Baghbanzadeh, Felice C. Simeone, Kung-Ching Liao, **Sergey N. Semenov**, Tomasz Żaba, Piotr Cyganik, Alan Aspuru-Guzik,

- George M. Whitesides “Tunneling across SAMs Containing Oligophenyl Groups” // *J. Phys. Chem. C*, (2016), *120*, 11331 – 11337.
4. Florian Schwarz, Georg Kastlunger, Franziska Lissel, Carolina Egler-Lucas, **Sergey N. Semenov**, Koushik Venkatesan, Heinz Berke, Robert Stadler, Emanuel Lörtscher “Field-induced Conductance Switching by Charge-state Alternation in Organometallic Single-Molecule Junctions” // *Nature Nanotechnol.*, (2016), *11*, 170 - 176.
 5. Albert S.Y. Wong, Sjoerd Postma, Ilia N. Vialshin, **Sergey N. Semenov**, Wilhelm T. S. Huck “The influence of molecular structure on the properties of out-of-equilibrium oscillating enzymatic reaction networks” // *J. Am. Chem. Soc.*, (2015), *137*, 12415 – 12420.
 6. **Sergey N. Semenov**, Albert S.Y. Wong, Martijn van der Made, Sjoerd Postma, Rik van Roekel, Tom F. A. De Greef, Wilhelm T. S. Huck “Rational design of functional and tunable oscillating enzymatic networks” // *Nature Chemistry*, (2015), *7*, 160 – 165.
 7. **Sergey N. Semenov**, Albert J. Markvoort, Tom F. A. de Greef, Wilhelm T. S. Huck “Threshold Sensing Through a Synthetic Enzymatic Reaction-Diffusion Network” // *Angew. Chem. Int. Ed.* (2014), *53*, 8066 – 8069.
 8. **Sergey N. Semenov**, Sjoerd G.J. Postma, Ilia N. Vialshin, Wilhelm T. S. Huck “Fluorescent hydrogels for studying Ca^{2+} - dependent reaction-diffusion processes” // *Chem. Commun.*, (2014), *50*, 3089-3092.
 9. Venkatachalam Chokkalingam, Jurjen Tel, Florian Wimmers, Xin Liu, **Sergey N. Semenov**, Julian Thiele, Carl G. Figdor, Wilhelm T.S. Huck “Probing Cellular Heterogeneity in Cytokine-Secreting Cells Using Droplet-Based Microfluidics” // *Lab on a Chip*, (2013), *13*, 4740 – 4744.
 10. **Sergey N. Semenov**, Albert J. Markvoort, Wouter B. L. Gevers, Aigars Piruska, Tom F. A. de Greef, Wilhelm T. S. Huck “Ultrasensitivity by Molecular Titration in Spatially Propagating Enzymatic Reactions” // *Biophys. J.*, (2013), *105*, 1057-1066.
 11. **Sergey N. Semenov**, Olivier Blacque, Thomas Fox, Koushik Venkatesan, Heinz Berke “[W(CO)(dppe)₂] Cumulenylidene and Acetylide Complexes Accessed via Stannylated Acetylenes and Butadiynes” // *Organometallics*, (2010), *29*, 6321-6328.
 12. **Sergey N. Semenov**, Shiva F. Taghipourian, Olivier Blacque, Thomas Fox, Koushik Venkatesan, Heinz Berke “An Iron Capped Metalorganic Polyyne $\{[\text{Fe}](\text{C}\equiv\text{C})_2[\text{W}]\equiv\text{CC}\equiv\text{CC}\equiv[\text{W}](\text{C}\equiv\text{C})_2[\text{Fe}]\}$ ” // *J. Am. Chem. Soc.*, (2010), *132*, 7584-7585.
 13. **Sergey N. Semenov**, Olivier Blacque, Thomas Fox, Koushik Venkatesan, Heinz Berke “Electronic Communication in Dinuclear C₄-Bridged Tungsten Complexes” // *J. Am. Chem. Soc.*, (2010), *132*, 3115-3127.
 14. Fabio Marchetti, Claudio Pettinari, Adriano Pizzabiocca, Andrey Drozdov, Sergey I. Troyanov, Constantine O. Zhuravlev, **Sergey N. Semenov**, Yuriy A. Belousov, Ivan G. Timokhin “Syntheses, structures, and spectroscopy of mono- and polynuclear lanthanide complexes containing 4-acyl-pyrazolones and diphosphineoxide” // *Inorg. Chem. Acta.*, (2010), *363*, 4038-4047.

15. **Sergey N. Semenov**, Olivier Blacque, Thomas Fox, Koushik Venkatesan, Heinz Berke “Self-Coupling of a 4-H-Butatrienylydene Tungsten Complex” // *Angew. Chem. Int. Ed.* (2009), 48, 5203-5206.
16. Oxana Kotova, **Sergey Semenov**, Svetlana Eliseeva, Sergey Troyanov, Konstantin Lyssenko, Natalia Kuzmina “New Helical Zinc Complexes with Schiff Base Derivatives of β -Diketonates or β -Keto Esters and Ethylenediamine” // *Eur. J. Inorg. Chem.*, (2009), 23, 3467-3474.
17. **Sergey N. Semenov**, Andrey Yu. Rogachev, Svetlana V. Eliseeva, Claudio Pettinari, Fabio Marchetti, Andrey A. Drozdov, Sergey I. Troyanov “First Direct Assembly of Molecular Helical Complexes into Coordination Polymer” // *Chem. Commun.*, (2008), 1992-1994.
18. Svetlana V. Eliseeva, Oxana V. Kotova, Frédéric Gumy, **Sergey N. Semenov**, Vadim G. Kessler, Leonid S. Lepnev, Jean-Claude G. Bünzli, Natalia P. Kuzmina “Role of the Ancillary Ligand N,N-Dimethylaminoethanol in the Sensitization of Eu^{III} And Tb^{III} Luminescence In Dimeric β -Diketonates” // *J. Phys. Chem. A*, (2008), 112, 3614-3626.
19. **Sergey N. Semenov**, Andrey Yu. Rogachev, Svetlana V. Eliseeva, Yury A. Belousov, Andrey A. Drozdov, Sergey I. Troyanov “5-nitroaminotetrazole as Building Block for Extended Network Structures: Syntheses and Crystal Structures of a Number of Heavy Metal Derivatives” // *Polyhedron*, (2007), 26, 4899-4907.
20. Claudio Pettinari, Fabio Marchetti, Riccardo Pettinari, Paolo Natanti, Andrey Drozdov, **Sergey Semenov**, Sergey I. Troyanov, Vladislav Zolin “Syntheses, Spectroscopic Characterization and X-Ray Structural Studies of Lanthanide Complexes with Adamantyl Substituted 4-Acylpyrazol-5-One” // *Inorg. Chem. Acta.*, (2006), 359, 4063-4070.
21. Claudio Pettinari, Fabio Marchetti, Riccardo Pettinari, Andrey Drozdov, **Sergey Semenov**, Sergey I. Troyanov, Vladislav Zolin “A New Rare-Earth Metal Acylpyrazolonate Containing the Zundel Ion H_5O_2^+ Stabilized by Strong Hydrogen Bonding” // *Inorg. Chem. Commun.*, (2006), 9, 634-637.
22. **Sergey N. Semenov**, Egor Yu. Maltsev, Ivan G. Timokhin, Sergey I. Troyanov, Andrey A. Drozdov “The Crystal Structure of Two Hydrated Tin Chlorides $\text{SnCl}_4 \cdot 2\text{H}_2\text{O}$ And $\text{SnCl}_4 \cdot 3\text{H}_2\text{O}$ ” // *Mend. Commun.*, (2005), 205-207.
23. Claudio Pettinari, Riccardo Pettinari, Fabio Marchetti, Andrey Drozdov, Ivan Timokhin, **Sergey Semenov**, Sergey I. Troyanov “The Role of Reaction Medium on the Coordination Environment of Terbium in Complexes with 4-Acylpyrazol-5-Ones” // *Inorg. Chem. Commun.*, (2003), 6, 1423-1425.

Teaching Experience

- Supervisor of a summer students, Harvard University 2016-1017
- Guest Lecturer, Moscow State University 2012
Department of Materials Science
Original course of 6 lectures “Organometallic chemistry: catalysis and new materials”
- Guest Lecturer, Moscow State University 2011
Department of Materials Science
Original course of 8 lectures “Organometallic chemistry: catalysis and new materials”

- Supervisor of a master's project, Radboud University of Nijmegen 2011
- Supervisor, University of Zurich
Inorganic chemistry laboratory course 2 2010
- Assistant, University of Zurich
Inorganic chemistry laboratory course 1 2009
- Supervisor of bachelor projects, Moscow State University 2006
- Chemistry Teacher, Moscow State University 2005 – 2006
School for young chemists (12-14 years old pupils)

Professional Services

Reviewer: *Nature Communications, Dalton Transactions, Crystal Engineering Communications, Chemical Communications, Journal of Materials Chemistry, Physical Chemistry Chemical Physics, Journal of Molecular Structure.*

Grant Writing Experience

National Research Program "Smart Materials" (NRP 62, grant 406240- 126142) of the Swiss National Science Foundation (SNSF) (co-wrote) 2010

Conferences, Oral Presentations

1. Keynote speaker, "Oscillations in networks of organic and enzymatic reactions: towards active smart materials" 2017 International Conference on BioNano Innovation, 24-27 September, Brisbane, Australia. 2017
2. "Autocatalytic, bistable, oscillatory networks of biologically relevant organic reaction", Meeting of the American Chemical Society, 21-26 August 2016, Philadelphia, Pennsylvania, USA
3. "Autocatalytic, Bistable, Oscillatory Networks of Biologically Relevant Organic Reaction", Gordon Research Conference on Oscillations & Dynamic Instabilities in Chemical Systems, 17-22 July 2016, Stowe, Vermont, USA
4. "Autocatalytic, Bistable, Oscillatory Networks of Biologically Relevant Organic Reaction", Gordon Research Seminar on Oscillations & Dynamic Instabilities in Chemical Systems, 16-17 July 2016, Stowe, Vermont, USA
5. "A synthetic enzymatic oscillating network", sIMMposium, 5-6 June 2013, Nijmegen, The Netherlands
6. "Towards a synthetic enzymatic oscillating network", Engineering of Chemical Complexity, 10-13 June 2013, Rostock, Germany
7. "The role of ultrasensitivity in signal propagation of enzymatic reactions: an *in-vitro* model system", Gordon Research Conference on Oscillations & Dynamic Instabilities in Chemical Systems, 15-20 July 2012, Colby College, Waterville, USA
8. "Electron transfer in tungsten organometallic molecules", Fall Meeting of the Swiss Chemical Society, 16 September 2010, Zurich, Switzerland