Dr. Olga O. Bochkareva

Date of Birth: Sept. 10, 1988

Citizenship: Russia

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Web page (personal): https://www.bochkareva.me/

Web page (current lab): https://ist.ac.at/en/research/kondrashov-group/.

List of all publications: https://orcid.org/0000-0003-1006-6639

Languages: Russian (native), English (fluent), German (A1)

Married, two children

Research interests:

- Architecture and evolution of bacterial chromosomes: genome rearrangements, horizontal gene transfer, homologous recombination, multi-chromosome bacterial species.

- Evolution of protein sequences and operons structure.

- Evolution of bacterial communities: pan-genomics, metagenomics, taxonomy.

- Pathogenicity, resistance, microbe-host interactions.

Work experience:

June 2019- present *postdoctoral researcher, Institute of Science and Technology, Vienna, Austria. Prof. Fyodor Kondrashov group.*

2017- 2019 junior research scientist, Kharkevich Institute for Information Transmission Problems RAS, Moscow, Russia

2017- 2019 junior research scientist, Department of Life Sciences, Skolkovo Institute of Science and Technology, Moscow, Russia

Education:

2012–2019 Ph.D., Kharkevich Institute for Information Transmission Problems RAS. PhD thesis: *"Reconstruction of evolutionary history of genome rearrangements in bacteria",* Supervisor: *Prof. Mikhail S. Gelfand.*

2010–2012 Master of Science (applied mathematics and physics), Department of Molecular and Biological Physics, Moscow Institute of Physics and Technology. Master thesis *"Bacterial microevolution and genome rearrangements",* Supervisor: *Prof. Mikhail S. Gelfand.*

2005–2010 Bachelor of Science (applied mathematics and physics), Department of Molecular and Biological Physics, Moscow Institute of Physics and Technology. Bachelor thesis "The convergence of the over-relaxation method depending on the iteration parameter choice for the 2-D Poisson equation", Supervisor: *Prof. Sergey Surzhikov*, Ishlinsky Institute for Problems in Mechanics RAS.

Funding and Awards:

2019-2021 ISTplus postdoctoral fellowship. Funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 754411

Publications:

6 peer-reviewed publications, 3 first and 2 last authorships, 45 citations (GoogleScholar on 06/09/2021)
(- equal contribution)*

1. Alexey Zabelkin, Yulia Yakovleva, **Olga Bochkareva**[*], Nikita Alexeev[*]. PaReBrick: PArallel REarrangements and BReaks identification toolkit. **Bioinformatics** 2021 Oct 03 https://doi.org/10.1093/bioinformatics/btab691
2. Zaira Seferbekova, Alexey Zabelkin, Yulia Yakovleva, Robert Afasizhev, Nikita Alexeev, Mikhail S Gelfand, **Olga O Bochkareva** High rates of genome rearrangements and pathogenicity of *Shigella* spp. **Frontiers Microbiology** 2021 Apr 12; 12:831. doi:10.3389/fmicb.2021.628622
3. Olga Sigalova, Andrei V Chaplin, **Olga O Bochkareva**, Pavel V Shelyakin, Vsevolod A Filaretov, Evgeny E Akkuratov, Valentina Burskaya, Mikhail S Gelfand *Chlamydia* pan-genomic analysis reveals balance between host adaptation and selective pressure to genome reduction. **BMC Genomics.** 2019 Sep 12;20(1):710. doi: 10.1186/s12864-019-6059-5.
4. Pavel V Shelyakin*, **Olga O Bochkareva***, Anna A Karan, Mikhail S Gelfand Micro-evolution of three *Streptococcus* species: selection, antigenic variation, and horizontal gene inflow. **BMC Evol. Biol.** 2019. Mar 27;19(1):83. doi: 10.1186/s12862-019-1403-6.
5. **Olga O Bochkareva**, Elena V Moroz, Iakov I Davydov, Mikhail S Gelfand Genome rearrangements and selection in multi-chromosome bacteria *Burkholderia* spp. **BMC Genomics**. 2018 Dec 27;19(1):965. doi: 10.1186/s12864-018-5245-1.
6. **Olga O Bochkareva**, Natalia O Dranenko, Elena S Ocheredko, German M Kanevsky, Yaroslav N Lozinsky, Vera A Khalaycheva, Irena I Artamonova, Mikhail S Gelfand Genome rearrangements and phylogeny reconstruction in *Yersinia pestis*. **PeerJ**. 2018 Mar 27;6:e4545. doi: 10.7717/peerj.4545.

Supervised projects:

2021 ***Natalia Dranenko****, IITP RAS, Russia*
The Classification of *ipaH* Genes in *Shigella* and Enteroinvasive *Escherichia*, **MCCMB'21** poster presentation

2021 ***Ariadna Semenova****, Moscow State University, Russia*
Insertion sequences in *B. mallei*: adaptation to intracellular lifestyle, **MCCMB'21** poster presentation

2020 ***Yulia Yakovleva, Alexey Zabelkin*** *Bioinformatics Institute, Russia*
PaReBrick: PArallel REarrangements and BReakpoints identification toolkit
published *in* ***Bioinformatics*** *doi:10.1101/2021.05.18.444676*

2020 ***Kristina Perevoshchikova****, Moscow State University, Russia*
Evolutionary benefits of bacterial genomes with chromids, **MCCMB'21** oral presentation

2019 ***Zaira Seferbekova****, Moscow State University, Russia*
Impact of mobile elements into pathogenicity of *Shigella*
published in ***Frontiers Microbiology*** *10.1186/s12862-019-1403-6*

2019 Moldir Zhiyenbayeva, graduate student at HSE, Moscow, Russia. Co-advising **master project** "Comparative Genomics of *Bacillus* spp.*"*. PI: Mikhail Gelfand.
2018 Natalia Dranenko, graduate student at MIPT, Moscow, Russia. Co-advising **bachelor project** "Reconstruction of OxyR ancestor sequence in bacteria". PI: Mikhail Gelfand.

Collaborations:

2020-present Dr. Nikina Alexeyev, ITMO University, Saint Petersburg, Russia. Project: Development of the bioinformatic toolkit for whole-genome analysis.

2020-present Prof. Christoph Gasche, Medical University of Vienna, Vienna, Austria. Project: Genetic factors under biofilms formation in pathogenic *E.coli*.

2016-2018 Prof. Marc Robinson-Rechavi, Evolutionary Bioinformatics Lab, Department of Ecology and Evolution, Université de Lausanne, Lausanne, Switzerland. Project: Positive selection and horizontal gene transfer in prokaryotes.

2010-2014 Prof. Pavel Pevzner, University of California at San Diego, California, USA. Project: Application of the MGRA (Multiple Genome Rearrangements and Ancestors) algorithm to microbial data.

Teaching experience:

Summer School of Theoretical and Molecular Biology

2020 – **2021 Head of STEM department** - design of lectures and courses, recruiting lecturers and course instructors, management of courses execution, and moderation of scientific discussions.

2020 – **2021 Head of Laboratory** – 4 project leaders and 4-6 students.
2016 – **2019 Project Leader** - design and supervision a research-based teaching project.

Lecturer/course instructor:

Designed and delivered courses

- **Fall 2020 "Comparative genomics of prokaryotes"**, course for master students (Bioinformatics Institute, St Petersburg, Russia), in Russian. Final evaluation by students: 9.3 out of 10 (the highest evaluation across all courses during the term)

Invited lectures and other teaching contributions:

Designed and delivered selected lectures and labs, prepared and supervised course projects and home assignments

- **Spring 2019 "Bioinformatics"**, course for master and PhD students (Skoltech, Moscow, Russia), in English
- **Autumn 2018 "Comparative Genomics",** course for master and PhD students (joint program Skoltech/HSE, Moscow, Russia), in English

2020 Structure and evolution of bacterial chromosomes Bioinformatics Institute Open Lectures (youtube)
2020 Comparative genomics of prokaryotes, cookbook, Summer School of Bioinformatics Institute (youtube)

Reviewer:

in Microbial Genomics, Journal of Bioinformatics and Computational Biology, PeerJ

Professional skills:

Bioinformatics (comparative and evolutionary genomics)

genome assembly and annotation, phylogeny reconstruction, rearrangements reconstruction, sequences alignment, ancestral sequences reconstruction, HGT identification, selection identification, statistics. See also a list of specialized tools I use in my CookBook.

Programming: (Bio-)Python, R

Academic writing *(+LaTeX),* ***data visualization***