

**BIOGRAPHICAL SKETCH**

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NAME: Klykov, Oleg

eRA COMMONS USER NAME (credential, e.g., agency login): OLEGVK

POSITION TITLE: Postdoctoral Fellow

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

| INSTITUTION AND LOCATION                          | DEGREE<br>(if applicable) | Completion Date<br>MM/YYYY | FIELD OF STUDY          |
|---|---------------------------|----------------------------|-------------------------|
| Lomonosov Moscow State University, Moscow, Russia | MS<br>(Diploma)           | 06/2012                    | Organic Chemistry       |
| Utrecht University, Utrecht, The Netherlands      | Ph.D.                     | 10/2019                    | Pharmaceutical Sciences |

**A. Personal Statement**

My long-term research goals and career interest lie in the field of neurobiology. I aim to delve into the mechanisms of how our brain is functioning by several multidisciplinary approaches. The main target is the synaptic receptor proteins involved in communication between neurons. Before focusing on the brain proteins, I have gained extensive academic training and diverse research experience that have provided me with an excellent background in analytical, organic, and biochemistry. After I graduated from university with distinction, I have spent three years at BAM Federal Institute (Berlin, Germany) studying small molecules and protein purification by means of analytical chemistry. For my predoctoral studies, I joined the group of Dr. Albert J.R. Heck at Utrecht Institute of Pharmaceutical Sciences within Utrecht University (Utrecht, The Netherlands). My research was focused on the development and application of MS-based structural characterization of various biological samples and potential drug targets. I took a part in developing a novel protocol for structural MS analysis of complex biological samples and gained expertise in computational structural biology. While being the first author of several methodological papers, I was also able to follow my main research interest and took a part in a project devoted to transport neuronal proteins. During my predoctoral studies, I have received three travel awards (American MS Society, European Molecular Biology Organization, and the Dutch MS Society). For my postdoctoral studies, I have joined the lab of Dr. Alexander Sobolevsky at Columbia University. My main project here is to decipher the structures of ionotropic glutamate receptors (iGluRs) and specifically AMPA receptors (AMPA receptors). In this lab, I get extensive training in protein design, expression, and comprehensive protein analysis by Electron Microscopy (EM) and electrophysiological methods. My choice of host lab, sponsor, and training provides me with the necessary skills to establish my research line, allows to expand my instrumental toolbox, and gives the necessary background for my future studies of the human brain. Despite various COVID-related complications in 2020, I was able to successfully integrate into the new lab and started to pursue my long-term goal of understanding the human brain on a molecular level. The described proposal combines my previous knowledge in work with proteins and fulfills my interest in neurobiology on a molecular level.

1. Klykov O., Steigenberger B., Pektas S., Fasci D., Heck A.J.R., Scheltema R.A. (2018) Efficient and robust proteome-wide approaches for proteome-wide crosslinking mass spectrometry. Nat. Protoc. 13: 2694-2990.PMID: 30446747
2. Stucchi R., Plucinska G., Hummel J.J.A., Zahavi E.E., San Juan I.G., Klykov O., Scheltema R.A., Altelaar A.F.M., Hoogenraad C.C. (2018) Regulation of KIF1A-driven dense core vesicle transport: Ca<sup>2+</sup>/CaM controls DCV binding and Liprin- $\alpha$ /TANC2 recruits DCVs to postsynaptic sites. Cell Rep. 24: 685-700 PMCID: PMC6077247

3. Klykov O, van der Zwaan C., Heck A.J.R., Meijer A.B., Scheltema R.A. (2020) Missing regions within the molecular architecture of human fibrin clots structurally resolved by XL-MS and integrative structural modeling. PNAS 117(4):1976-1987. PMID: PMC6995014

## B. Positions and Honors

### Positions and Employment

|             |   |
|-------------|---|
| 2007 – 2012 | Pre-diploma Research Fellow, Lomonosov Moscow State University                                |
| 2012 – 2015 | Research Scientist, BAM Federal Institute For Materials Research and Testing, Berlin, Germany |
| 2015 – 2019 | Predoctoral Research Fellow, Utrecht University, Utrecht, The Netherlands                     |
| 2020 –      | Postdoctoral Research Fellow, Columbia University   |

### Other Experience and Professional Memberships

|             |  |
|-------------|--|
| 2012 – 2015 | DGMS, German Society for Mass Spectrometry |
| 2015 –      | NVMS, Dutch Society for Mass Spectrometry  |
| 2020 –      | AHA partner, American Heart Association    |

### Honors

|      |   |
|------|---|
| 2008 | Undergraduate Annual Thesis Competition on Analytical Chemistry at the Lomonosov University, Winner                 |
| 2018 | American Society for Mass Spectrometry (ASMS), Sanibel Conference Travel Grant                                      |
| 2019 | Netherlands Society for Mass Spectrometry (NVMS) Conference, Fund Award   |
| 2019 | European Molecular Biology Organization Practical Course: Integrative and cellular structural Biology, Travel Award |

## C. Contributions to Science

1. **Early Career:** My early career contributions were focused on method developments and application of analytical techniques for analysis of biological samples. I worked at the physical chemistry lab at the university of North Dakota where I was operating the Graphite Atomic Absorption Furnace Spectrometer and performed the analysis of the acquired data. For my diploma degree project, I was analyzing a part of mass spectrometric outputs within a laboratory of Organic Analysis at the Lomonosov Moscow State University. I was also a part of the Protein Analysis group within a BAM Federal Institute in Germany where I was mostly maintaining the chromatography equipment and eventually me and my supervisor developed a quantitative chromatography-based technique to detect one of the products of decomposition of commonly used biochemical reagent.
  - a. Raeva A.A., Klykov O.V., Kozliak E.I., Pierce D.T., Seames W.S. (2011) In Situ Evaluation of Inorganic Matrix Effects on the Partitioning of Three Trace Elements (As, Sb, Se) at the Outset of Coal Combustion. Energy & Fuels 25: 4290-4298
  - b. Samgina T.Y., Gorshkov V.A., Artemenko K.A., Vorontsov E.A., Klykov O.V., Ogourtsov S.V., Zubarev, R.A., Lebedev A.T. (2012) LC–MS/MS with 2D mass mapping of skin secretions' peptides as a reliable tool for interspecies identification inside Rana esculenta complex. Peptides 34: 296-302.PMID: 22401909
  - c. Klykov O., Weller M.G. (2015) Quantification of N-hydroxysuccinimide and N-hydroxysulfosuccinimide by hydrophilic interaction chromatography (HILIC) Anal. Methods 7:6443-6448.
2. **Graduate Career:** My graduate research contributions focused on the application of structural mass spectrometry to protein targets and whole cell lysates. As a result of my work, crosslinking MS approach has become widely accepted and applicable to whole-cell and extremely complex biological samples as in comparison to the protein complexes of limited complexity. I have developed and optimized the whole pipeline including sample preparation, data acquisition protocol, and data analysis platform. I have applied this protocol to get an insight into the structures of the gene-editing protein complex and the mechanism of

neuronal dense-core vesicle transport. I also applied it to study the protein-based fibrin blood clot biopolymer. For the first time it was possible to show the arrangement of the assembled fibrin clot on a molecular level and describe the mechanism of interference of high albumin concentration in blood with coagulation process. Results of these investigations were published in peer-reviewed scientific journals.

- a. Fagerlund R.D., Wilkinson M.E., Klykov O, Barendregt A., Pearce G.F., Kieper S.N., Maxwell H.W.R., Capolupo A., Heck A.J.R., Krause K.L., Bostina M., Scheltema R.A., Staals R.H.J., Fineran P.C. (2017) Spacer capture and integration by a type IIF Cas1–Cas2-3 CRISPR adaptation complex. PNAS 114:E5122-E5128. PMID: PMC5495228
- b. Klykov O., Steigenberger B., Pektas S., Fasci D., Heck A.J.R., Scheltema R.A. (2018) Efficient and robust proteome-wide approaches for proteome-wide crosslinking mass spectrometry. Nat. Protoc. 13: 2694-2990. PMID: 30446747
- c. Stucchi R., Plucinska G., Hummel J.J.A., Zahavi E.E., San Juan I.G., Klykov O., Scheltema R.A., Altelaar A.F.M., Hoogenraad C.C. (2018) Regulation of KIF1A-driven dense core vesicle transport: Ca<sup>2+</sup>/CaM controls DCV binding and Liprin- $\alpha$ /TANC2 recruits DCVs to postsynaptic sites. Cell Rep. 24: 685-700 PMID: PMC6077247
- d. Klykov O, van der Zwaan C., Heck A.J.R., Meijer A.B., Scheltema R.A. (2020) Missing regions within the molecular architecture of human fibrin clots structurally resolved by XL-MS and integrative structural modeling. PNAS 117(4):1976-1987; PMID: PMC6995014

3. **Postdoctoral Career:** As a postdoctoral fellow, I have recently joined the lab of Dr. Alexander Sobolevsky at the Department of Biochemistry and Molecular Biophysics at the Columbia University Medical Center. My focus here is to get a native structures of ionotropic glutamate receptors (iGluRs) and specifically AMPARs by means of cryogenic electron microscopy (cryo-EM). AMPARs are responsible for the majority of excitatory neurotransmission in the brain and complete understanding of mechanism of their action will shed a light on brain development and functioning. Currently I have spent one full year in this lab including 4 months under university shutdown due to the COVID-19. Nonetheless, in close collaboration with my colleagues, I was able to design the relevant construct, express and purify target protein complex for this proposal.

#### **Complete List of Published Work in My Bibliography:**

<https://www.ncbi.nlm.nih.gov/myncbi/1ZEenY0ebbnAq/bibliography/public/>

### **D. Additional Information: Research Support and/or Scholastic Performance**

#### **Scholastic Performance**

I have attended most of the courses in Russia and Europe and therefore I do not indicate them here. While being a part of Utrecht Institute for Pharmaceutical Sciences (UIPS) within Graduate School of Life Sciences (GS-LS), I have attended several external and internal courses with no grades but passed mark.

| YEAR | COURSE TITLE   | GRADE  |
|------|--|--------|
| 2015 | Biomolecular Mass Spectrometry and Proteomics  | PASSED |
| 2015 | UIPS Introductory Course   | PASSED |
| 2016 | MaxQuant Summer School (Oxford, UK)  | PASSED |
| 2016 | Giving Effective Oral Presentation   | PASSED |
| 2016 | Safe Research Data Management  | PASSED |
| 2017 | Introduction to Python for Life Sciences   | PASSED |
| 2017 | Introduction to R & Data   | PASSED |
| 2017 | Advanced R for Life Sciences   | PASSED |
| 2017 | Writing Successful Grant Proposals   | PASSED |
| 2017 | GS-LS PhD Day 2017: Getting Published from A to Z  | PASSED |
| 2018 | EMBO Practical Course: Integrative modelling of biomolecular interactions (Barcelona, Spain) | PASSED |

| YEAR | COURSE TITLE  | GRADE  |
|------|---|--------|
| 2018 | Scientific Presentation Skills  | PASSED |
| 2018 | GS-LS PhD Day 2018: Talkin' Science: Getting Your Message Across                      | PASSED |
| 2019 | Introductory Biostatistics for Researches   | PASSED |
| 2019 | Preparation Course for Pitch Competition: Breaking Science                            | PASSED |
| 2019 | EMBO Practical Course: Integrative and cellular structural biology<br>(Paris, France) | PASSED |