

INNOKENTIY V. MASLENNIKOV

Education:

- 1989 - 1992** MOSCOW INSTITUTE OF PHYSICS AND TECHNOLOGY MOSCOW, RUSSIA
Ph.D. in Biophysics, 1993
Thesis title: "Spatial structure of Bacteriorhodopsin transmembrane fragments"
- 1981 - 1986** MOSCOW STATE UNIVERSITY, FACULTY OF MECHANICS AND MATHEMATICS, DEPARTMENT OF HYDRODYNAMICS MOSCOW, RUSSIA
M.S. in Mathematics and Physics, 1986
Thesis title: "Biomechanics of respiration and trachea"

Experience:

- 2015 -** CHAPMAN UNIVERSITY, SCHOOL OF PHARMACY IRVINE, CALIFORNIA
Research Assistant Professor
- Structural and Imaging Core facility management and maintenance.
 - NMR spectroscopy support: data analysis and interpretation; chemical structure analysis and verification of synthetic and natural small molecule products; training new users, consultation and assistance in experiment setup and data analysis.
 - Tutoring, mentoring, and supervision of undergraduate and graduate students; hand-on training on various biophysical technique; development of the laboratory courses for students; mentoring of post-doctoral trainees.
- 2010 - 2015** JOINT CENTER FOR BIOSCIENCES SONGDO, INCHEON, SOUTH KOREA
Research Assistant Professor
- Developed method for fast NMR assignment of proteins using combinatorial isotope labeling.
 - Characterized and analyzed rhamnolipid mixtures by solution NMR spectroscopy.
- 2006 - 2014** THE SALK INSTITUTE FOR BIOLOGICAL STUDIES LA JOLLA, CALIFORNIA
Research Associate (2006-2007), Staff Scientist (since 2007), Structural Biology Laboratory (Prof. Choe)
- Developed method for fast structural analysis of membrane proteins by solution NMR.
 - Determined solution NMR structures of six human membrane proteins and of membrane domains of *E. coli* histidine kinase receptors.
 - Management of NMR facility: administration, maintenance, and troubleshooting of Bruker Avance-700 (with CryoProbe) and Varian NMR System 500 spectrometers.
- 1986 - 2006** RUSSIAN ACADEMY OF SCIENCES, SHEMYAKIN-OVCHINNIKOV INSTITUTE OF BIOORGANIC CHEMISTRY MOSCOW, RUSSIA
Research Assistant (1986-1989), Graduate Student (1989-1993), Senior Staff Researcher (1994-2006) Structural Biology Laboratory (Prof. Bystrov and Prof. Arseniev)
- NMR support of synthetic chemistry laboratories: analyzed and verified/solved more than 2500 structures of synthetic and natural products (carbohydrates, peptides, lipids, steroids).
 - Solved more than 15 structures of globular and membrane proteins and their domains.
 - Developed approaches and designed programs for protein multiconformational analysis and for structure validation.
 - Design and monitoring of construction of new NMR facility for installation of 800 MHz, 700 MHz and two 600 MHz NMR spectrometers.

Teaching and Supervision:

- 1991 - present** RUSSIAN ACADEMY OF SCIENCES and MOSCOW INSTITUTE OF PHYSICS AND TECHNOLOGY (MOSCOW, RUSSIA), SALK INSTITUTE FOR BIOLOGICAL STUDIES (LA JOLLA, CA), JOINT CENTER FOR BIOSCIENCES (INCHEON, SOUTH KOREA)

- Tutored and supervised undergraduate and graduate (14 M.S. and 7 Ph.D.) students
- Supervised and managed teams of postdoctoral researchers, research assistants, and technicians, conducting grant- and industry-funded research projects.

Skills:

- Solution NMR techniques: homonuclear (¹H, ²H, ¹³C, ¹⁹F, ²³Na, ³¹P), heteronuclear (¹H/¹³C/¹⁵N/¹⁹F).
- Structural analysis of membrane and globular proteins by multidimensional solution NMR.
- Analysis, verification and determination of chemical structures for small organic molecules (including analysis in mixtures) by homonuclear and heteronuclear 1D and 2D-NMR.
- Molecular modeling, molecular interaction analysis; molecular graphics, visualization, and animation.
- Protein purification and characterization: chromatography (gel-filtration, affinity, reverse-phase; FPLC and HPLC systems), mass-spectroscopy (Seldi), analytical ultracentrifugation, light scattering and refracting index analysis, CD spectroscopy.
- Troubleshooting protein expression, purification, and sample preparation for NMR and X-ray studies: protein yield, isotope labeling for NMR, sample purity, stability, and general quality, protein oligomerization, protein solubilization by detergents, detergent or buffer exchange.
- Troubleshooting biologics production for pre-clinical studies: detection and removal of impurities, contaminations, and residual buffer components.
- Experience in automation programming, script writing, programming languages (C, Python).
- Management of NMR facilities: administration, maintenance, and troubleshooting of Bruker (WM-500, DRX-500, Avance-700 with CryoProbe) and Varian (Unity600, NMR System 500) spectrometers. Administration and maintenance of data processing workstations (SUN, Silicon Graphics, PC, Mac) with Unix, Linux, Windows, and Mac OS operation systems.
- Managing research collaboration with academic and industrial partners on structural studies of natural and recombinant proteins, chimeric proteins, peptides, and other natural and synthetic products. Supervision of teams and laboratory staff, managing budget, preparation and presentation of proposals and reports.

Publications:

45. Hoppmann C, Maslennikov I, Choe S, Wang L. In Situ Formation of an Azo Bridge on Proteins Controllable by Visible Light. *J Am Chem Soc*, 2015, 137:11218-11221.
44. Eichmann C., Tzitzilonis C., Bordignon E., Maslennikov I., Choe S., Riek R. Solution NMR Structure and Functional Analysis of the Integral Membrane Protein YgaP from *E. coli*. *J. Biol. Chem.*, 2014, doi: 10.1074/jbc.M114.571935.
43. Lindert S., Maslennikov I., Chiu E., Pierce L.C., McCammon J.A., Choe S. Drug screening strategy for human membrane proteins: From NMR protein backbone structure to in silica- and NMR-screened hits. *Biochem Biophys Res Commun*, 2014, 445(4):724-733, doi: 10.1016/j.bbrc.2014.01.179
42. C. Ahn, I. Maslennikov, J. Y. Choi, H. Oh, C. Cheong, S. Choe, Characterization of Activin/BMP2 chimera, AB204, formulated for preclinical studies. *Prot Pept Lett*, 2014, 21(5):426-433.
41. Maslennikov I., Choe S. Advances in NMR structures of integral membrane proteins. *Curr Opin Struct Biol*, 2013, doi: 10.1016/j.sbi.2013.05.002.
40. Tzitzilonis C., Eichmann C., Maslennikov I., Choe S., Riek R. Detergent/Nanodisc screening for high-resolution NMR studies of an integral membrane protein containing a cytoplasmic domain. *PLoS One*, 2013, 8:e54378.
39. Klammt C., Maslennikov I., Bayrhuber M., Eichmann C., Vajpai N., Chiu E.J.C., Blain K.Y., Esquivies L., Kwon J.H.J., Balana B., Pieper U., Sali A., Slesinger P.A., Kwiatkowski W., Riek R., Choe S. Facile backbone structure determination of human membrane proteins by NMR spectroscopy. *Nature Methods*, 2012, 9:834-839.
38. Goncharuk M.V., Shul'ga A.A., Ermoliuk Ia.S., Tkach E.N., Goncharuk S.A., Pustovalova Iu.E.,

- Mineev K.S., Bocharov É.V., Maslennikov I.V., Arsen'ev A.S., Kirpichnikov M.P. Bacterial synthesis, purification, and solubilization of transmembrane segments of ErbB family members. *Mol. Biol.* (Moscow), 2011, 45:892-902.
37. Klammt C., Perrin M.H., Maslennikov I., Renault L., Krupa M., Kwiatkowski W., Stahlberg H., Vale W., Choe S. Polymer-based cell-free expression of ligand-binding family B G-protein coupled receptors without detergents. *Protein Sci.*, 2011, 20:1030-1041.
 36. Balana B., Maslennikov I., Kwiatkowski W., Stern K.M., Bahima L., Choe S., Slesinger P.A. Mechanism underlying selective regulation of G protein-gated inwardly rectifying potassium channels by the psychostimulant-sensitive sorting nexin 27. *Proc Natl Acad Sci USA*, 2011, 108:5831-5836.
 35. Mineev K.S., Bocharov E.V., Volynsky P.E., Goncharuk M.V., Tkach E.N., Ermolyuk Y.S., Schulga A.A., Chupin V.V., Maslennikov I.V., Efremov R.G., Arseniev A.S. Dimeric structure of the transmembrane domain of glycophorin A in lipidic and detergent environments. *Acta Naturae*. 2011 3:90-98.
 34. Maslennikov I., Klammt C., Hwan E., Kefala G., Okamura M., Esquivies L., Mörs K., Glaubitz C., Kwiatkowski W., Jeon Y.H., and Choe S. Membrane domain structures of three classes of histidine kinase receptors by cell-free expression and rapid NMR analysis. *Proc. Natl. Acad. Sci. USA*, 2010, 107:10902-10907.
 33. Kefala G., Ahn C., Krupa M., Esquivies L., Maslennikov I., Kwiatkowski W., Choe S. Structures of the OmpF porin crystallized in the presence of foscholine-12. *Protein Sci*, 2010, 19:1117-1125.
 32. Maslennikov I., Krupa M., Dickson C., Esquivies L., Blain K., Kefala G., Choe S., Kwiatkowski W. Characterization of protein detergent complexes by NMR, light scattering, and analytical ultracentrifugation. *J Struct. Funct. Genomics*, 2009, 10:25-35.
 31. Mario M.-C. Kuo, Innokentiy Maslennikov, Brent Molden and Senyon Choe. The Desensitization Gating of the MthK K⁺ Channel is Governed by its Cytoplasmic Amino Terminus. *PLoS Biology*, 2008, 6:2286-2296.
 30. Kefala G., Kwiatkowski W., Esquivies L., Maslennikov I., Choe S. Application of Mystic to improving the expression and membrane integration of histidine kinase receptors from *Escherichia coli*. *J Struct Funct Genomics*, 2007, 8:167-172.
 29. Maslennikov I., Kefala G., Johnson C., Riek R., Choe S., Kwiatkowski W. NMR spectroscopic and analytical ultracentrifuge analysis of membrane protein detergent complexes, *BMC Struct Biol.*, 2007, 7:74-85.
 28. Bocharov E.V., Pustovalova Yu.E., Pavlov K.V., Volynsky P.E., Goncharuk M.V., Ermolyuk Ya.S., Karpunin D.V., Schulga A.A., Kirpichnikov M.P., Efremov R.G., Maslennikov I.V., Arseniev A.S. Unique dimeric structure of BNip3 transmembrane domain suggests membrane permeabilization as a cell death trigger. *J Biol Chem*. 2007, 282:16256-16266.
 27. I.E. Kasheverov, D.C. Chiara, M.N. Zhmak, I.V. Maslennikov, V.S. Pashkov, A.S. Arseniev, Yu.N. Utkin, J.B. Cohen and V.I. Tsetlin. alpha-Conotoxin GI benzoylphenylalanine derivatives: 1H-NMR structures and photoaffinity labeling of the *Torpedo californica* nicotinic acetylcholine receptor. *FEBS Journal*, 2006, 273:1373-1388.
 26. Jiang M., Zhang M., Maslennikov I.V., Liu J., Wu D.M., Korolkova Y.V., Arseniev A.S., Grishin E.V., Tseng G.N. Dynamic conformational changes of extracellular S5-P linkers in the hERG channel. *J Physiol.*, 2005, 569:75-89.
 25. Kirpichnikov M.P., Goncharuk M.V., Yermolyuk Ya.S., Goncharuk S.A., Shulga A.A., Maslennikov I.V., Arseniev A.S., Structural biology of the membrane peptides. *Tekhnologii Zhivyyh System* (Russian), 2005, 2:13-18.
 24. I.E. Kasheverov, M.N. Zhmak, I.V. Maslennikov, Yu.N. Utkin, and V.I. Tsetlin, A comparative study on selectivity of a-Conotoxins GI and ImI using their synthetic analogues and derivatives (2003) *Neurochemical Research*, 28:599-606.
 23. Arseniev A.S., Korzhnev D.M., Orekhov V.Yu., Maslennikov I.V. NMR study of bacteriorhodopsin structure and dynamics. In *Protein structures: Kaleidoscope of Structural Properties and Functions*. 2003, Ed. V.N. Uversky, 273-297.

22. Yu.V. Korolkova, E.V. Bocharov, K. Angelo, I.V. Maslennikov, O.V. Grinenko, A.V. Lipkin, E.D. Nosyreva, K.A. Pluzhnikov, S.-P. Olesen, A.S. Arseniev, E.V. Grishin, New binding site on common molecular scaffold provides HERG channel specificity of scorpion toxin BeKm-1. *J. Biol. Chem.*, 2002, 277:43104-43109.
21. Utkin Y.N., Kukhtina V.V., Maslennikov I.V., Eletsy A.V., Starkov V.G., Weise C., Franke P., Hucho F., Tsetlin V.I. First tryptophan-containing weak neurotoxin from cobra venom. *Toxicon*, 2001, 39:921-927.
20. Eletsy A.V., Maslennikov I.V., Kukhtina V.V., Utkin Y.N., Tsetlin V.I., Arseniev A.S. Spatial structure and conformational heterogeneity of the weak toxin from *Naja kaouthia* cobra venom. *Bioorganicheskaya Khimiya* (Russian), 2001, 27:89-101.
19. Zolotarev I.A., Bocharov E.V., Dadaian A.K., Kasheverov I.E., Zhmak M.N., Maslennikov I.V., Borisov I.A., Arseniev A.S., Miasoedov N.F., Tsetlin V.I. Study of solid-phase catalytic isotopic exchange of hydrogen in a-conotoxin G1 under the effect of spillover-tritium. *Bioorganicheskaya Khimiya* (Russian), 2000, 26:587-592.
18. Pashkov V.S., Maslennikov I.V., Tchikin L.D., Efremov R.G., Ivanov V.T., Arseniev A.S. Spatial structure of the M2 transmembrane segment of the nicotinic acetylcholine receptor α -subunit. *FEBS Letters*, 1999, 457:117-121.
17. Maslennikov I.V., Shenkarev Z.O., Zhmak M.N., Ivanov V.T., Methfessel C., Tsetlin V.I., Arseniev A.S. NMR spatial structure of α -conotoxin ImI reveals a common scaffold in snail and snake toxins recognizing neuronal nicotinic acetylcholine receptors. *FEBS Letters*, 1999, 444:275-280.
16. Lugovskoy A.A., Maslennikov I.V., Utkin Yu.N., Tsetlin V.I., Cohen J.B., Arseniev A.S. Spatial structure of M3 transmembrane segment of nicotinic Acetylcholine Receptor α -subunit. *European Journal of Biochemistry*, 1998, 255:455-461.
15. Maslennikov I.V., Sobol A.G., Gladky K.V., Lougovskoy A.A., Ostrovsky A.G., Tsetlin V.I., Ivanov V.T., Arseniev A.S. Two distinct structures of α -conotoxin GI in aqueous solution. *European Journal of Biochemistry*, 1998, 254:238-247.
14. Utkin Yu.N., Krivoshein A.V., Davydov V.L., Kasheverov I.E., Franke P., Maslennikov I.V., Arseniev A.S., Hucho F., Tsetlin V.I. Labeling of *T. californica* nicotinic acetylcholine receptor subunits by cobratoxin derivatives with photoactivatable groups of different chemical nature at Lys 23. *European Journal of Biochemistry*, 1998, 253:229-235.
13. Maslennikov I.V., Lugovskoy A.A., Arseniev A.S., Tchikin L.D., Ivanov V.T. Spatial Structure of 87-136 Bacterioopsin Fragment. *Bioorganicheskaya Khimiya* (Russian), 1997, 23:771-782.
12. Maslennikov I.V., Sobol A.G., Anagli J., James P., Vorherr T., Arseniev A.S., Carafoli E. The Secondary Structure of Phospholamban: A Two Dimensional NMR Study. *Biophys. Biochem. Res. Commun.*, 1995, 217:1200-1207.
11. Maslennikov I.V., Bocharov E.V., Arseniev A.S. Spatial Structure of Transmembrane Segments C, E, and G of Bacteriorhodopsin by Two-Dimensional ^1H NMR Spectroscopy. *Bioorganicheskaya Khimiya* (Russian), 1995, 21:659-674.
10. Nifant'ev N.E., Tsvetkov Yu.E., Shashkov A.S., Tuzikov A.B., Maslennikov I.V., Popova I.S., Bovin N.V. Selectin Receptors: 1. Synthesis of the tetrasaccharides SiaLe^a and SiaLe^x and polymer conjugates of them. *Bioorganicheskaya Khimiya* (Russian), 1994, 20:551-555.
9. Maslennikov I.V., Arseniev A.S., Tchikin L.D., Kozhich A.T., Ivanov V.T. Two-Dimensional NMR Study of the Bacteriorhodopsin Transmembrane Segments C, E, and G. *Bioorganicheskaya Khimiya* (Russian), 1993, 19:5-20.
8. Maslennikov I.V., Lomize A.L., Arseniev A.S. Structure Refinement of (34-65)-Bacterioopsin from NMR Data in Solution. *Bioorganicheskaya Khimiya* (Russian), 1991, 17:1456-1469.
7. Maslennikov I.V., Arseniev A.S., Tchikin L.D., Kozhich A.T., Bystrov V.F., Ivanov V.T. Conformation of the Transmembrane Segment D of the Bacteriorhodopsin. *Biologicheskaya Membrany* (Russian), 1991, 8:156-160.
6. Lomize A.L., Arseniev A.S., Maslennikov I.V., Bystrov V.F. Determination of the Local Structure of the Scorpion Insectotoxin I5A from NMR Data. *Bioorganicheskaya Khimiya* (Russian), 1990,

16:1310-1324.

5. Maslennikov I.V., Arseniev A.S., Kozhich A.T., Bystrov V.F., Ivanov V.T. Conformation of the Transmembrane Segment G of the Bacteriorhodopsin. *Biologicheskiye Membrany* (Russian), 1990, 7:222-229.
4. Bystrov V.F., Arseniev A.S., Barsukov I.L., Golovanov A.P., Maslennikov I.V. The structure of transmembrane channel of Gramicidin A: NMR study of its conformational stability and interaction with divalent cations. *Gazzetta Chimica Italiana*, 1990, 120:485-491.
3. Bystrov V.F., Arseniev A.S., Barsukov I.L., Lomize A.L., Abdulaeva G.V., Sobol A.G., Golovanov A.P., Maslennikov I.V. 2D-NMR for 3D Structure of Membrane Spanning polypeptides: Gramicidin A and fragments of Bacteriorhodopsin. in "Protein Structure and Engineering" NATO ASI series, ed. O.Jardetzky, (1989), 183:111-138.
2. Arseniev A.S., Maslennikov I.V., Bystrov V.F., Kozhich A.T., Ivanov V.T., Ovchinnikov Yu.A. Two-Dimensional ¹H-NMR Study of Bacterioopsin-(34-65)-polypeptide conformation. *FEBS letters*, 1988, 231:81-88.
1. Maslennikov I.V., Arseniev A.S., Bystrov V.F. Spatial Structure of the N-acetyl-Gramicidin A in Micelles. *Biologicheskiye Membrany* (Russian), 1988, 4:459-474.

Patent:

Senyon Choe, Christian Klammt, Witek Kwiatkowski, Innokentiy Maslennikov. Methods and Compositions for NMR Spectroscopic Analysis Using Isotopic Labeling Schemes. US Patent 20,130,078,727, 2013; WO Patent 2,011,109,832

Invited Presentations:

6. Approaches for facilitation of structural studies of membrane proteins by solution NMR spectroscopy: combinatorial labeling for resonance assignment and systematic spin-labeling for paramagnetic relaxation analysis. International Workshop on Membrane protein structures by Cell-free synthesis, NMR analysis, and molecular dynamics. Academia Sinica, Taipei, Taiwan, 2013.
5. Membrane domain structures of three *E. coli* histidine kinase receptors by cell-free expression and rapid NMR analysis. XXIV-th International Conference on Magnetic Resonance in Biological Systems, Cairns, Australia, 2010.
4. Cell-free combinatorial dual labeling and accelerated assignment for structural studies of membrane proteins. Invited lecture at Korea Basic Science Institute, Ochang, South Korea, 2010.
3. Efficient approaches for membrane protein sample validation and characterization. Annual NIH Protein Structure Initiative meeting Enabling Technologies, 2009, Bethesda, USA.
2. Solution NMR spectroscopy of Membrane and Membrane-active Proteins. Invited lecture at Korea Basic Science Institute, Ochang, South Korea, 2007.
1. Conformational variability and structural mimicry of snail and snake toxins, targeting nicotinic acetylcholine receptors. XIII-th World Congress of the International Society on Toxinology, Paris, France, 2000.