

# Curriculum vitae Mikhail Yu. Kirillin

## Personal data, contact information

**Name:** Mikhail Yu. Kirillin,

Senior research fellow at Department for Radiophysics Methods in Medicine, Biophotonics Laboratory

**Tel:** +7 831 4164619

**E-mail:** kirillin@ufp.appl.sci-nnov.ru,

<http://www.bioimaging.ru/>



## Educational background

**2008** – Dr.Sc. (Tech.), Technology, University of Oulu, Faculty of Technology, Thesis title: “Optical coherence tomography of strongly scattering media”, Scientific advisor: R. Myllylä

**2004 – 2008:** Dr.Sc. Student of University of Oulu, Faculty of Technology

**2006** - Ph.D., Physics, M.V. Lomonosov Moscow State University. Department of Physics. Thesis title: “Light propagation in strongly scattering media and formation of signals in laser diagnostic systems”, Scientific advisor: A.V. Priezzhev

**2003 – 2006:** Ph.D. Student of M.V. Lomonosov Moscow State University. Department of Physics.

**2003** - Master of Science (with honors), Physics

**2001 – 2004:** Student of Russian-German Institute for Science and Culture (3-year program).

**1997 - 2003:** Master Student of M.V. Lomonosov Moscow State University. Department of Physics.

## Scientific interests

Light propagation in highly scattering media

- Theory of light propagation in highly scattering media, application for biotissues
- Optics of blood
- Optics of paper
- Optics of skin
- Computer simulation of light propagation in scattering media (Monte Carlo method)
- Optical methods of biomedical diagnostics
- Optical clearing
- Effect of nanoparticles on light propagation in scattering media

## Optical Coherence Tomography (OCT)

- Noninvasive monitoring of tissue optical properties
- OCT-based noninvasive blood glucose sensing
- Monte Carlo simulation of OCT signals and images
- OCT imaging in material sciences / production control
- Optical properties control and contrasting of OCT images

## Optical Diffuse Tomography

## Fluorescent Diffuse Tomography

### **Professional activity**

**2011 – present:** Senior Researcher, Institute of Applied Physics RAS, Nizhny Novgorod, Russia

**2011 – 2012:** Senior Researcher, N.I. Lobachevsky Nizhny Novgorod State University, Nizhny Novgorod, Russia

**2008 – 2011:** Researcher, Institute of Applied Physics RAS, Nizhny Novgorod, Russia

**2004 – 2008:** Researcher, University of Oulu, Finland

### Visits:

**2010, 2012:** Visiting Researcher, Royal Institute of Technology, Stockholm, Sweden.

**2009, 2010, 2012:** Visiting Researcher, University of Oulu, Finland

**2008:** Visiting Researcher, Cranfield University at Silsoe, UK

### **Membership in professional organizations**

**2002 – present:** The International Society for Optical Engineering (SPIE).

**2007- 2008:** Finnish Optical Society (FOS)

**2011 – present** Reviewer in *Biomedical Optics Express*,

**2008 – present** Reviewer in *Optics Express*, *Applied Optics*, *Journal of Optics and Laser technologies*, *Optics Letters*, *JIOHS*, *Journal of Biomedical Optics*, *JOSA*, *Optics and Spectroscopy*.

**2007 – present** Reviewer in *Journal of Biophotonics*

**2006 – present** Reviewer in *Quantum Electronics Journal*

**2013** Scientific Secretary of International Workshop “Clinical Biophotonics” at International Conference “Topical Problems of Biophotonics (TBP 2013)

**2013** Member of organizing committee of International Conference “Topical Problems of Biophotonics (TBP 2013)”

**2011** Scientific Secretary of German-Russian Workshop “Clinical Biophotonics” at International Conference “Topical Problems of Biophotonics (TBP 2013)

**2011** Member of organizing committee of International Conference “Topical Problems of Biophotonics (TBP 2011)”

**2010** Member of Program Committee of Biophotonics section of ICONO/LAT 2010 International Conference

**2010, 2012** Guest editor of special issue of *Journal of Biophotonics*.

**2009** Member of organizing committee of International Conference “Topical Problems of Biophotonics (TBP 2009)”

**2009** Scientific Secretary of Russian-French-German Laser Symposium 2009 (RFGLS 2009)

**2007** Member of organizing committee of Advanced Laser Technologies (ALT 2007) Conference

**2004** Member of organizing committee of High Laser School – Short Courses “Modern Problems of Laser Physics”

**2002 – 2003:** Treasurer of SPIE Student Chapter of M.V. Lomonosov Moscow State University.

### **Awards, prizes, grants**

**2012** – Diploma of Intel competition for applied studies and developments in the area of computer technologies “Computer continuum: for idea to implementation”

**2012** – 1<sup>st</sup> rank diploma of the winner of competition of young scientist’s research in the area of medical physics

**2007** - Tauno Tönning Foundation Scholarship

**2005** - SPIE Educational Scholarship

**2005** - Best Poster Prize of International Autumn School “Modern Biophysical Techniques for Human Health”

**2004** - Scholarship of the President of Russian Federation

**2004** - Diploma of the International Conference "Lomonosov 2004" for the best report in the workshop

**2003** - Diploma of International Laser Center.

**2003** - Diploma with Honors for achievements in studies, M.V. Lomonosov Moscow State University

### **Principal investigator**

**2012-2013:** Project of the Ministry of Education and Science of Russian Federation “Development of optical diagnostic methods for biological objects employing nanosize contrasting agents”

**2010-2011:** Grant of the President of Russian Federation for support of young scientists «Formation of tomographic images of biotissues under external action »

**2010-2012:** Grant of the Russian Foundation for Basic Research «Study of mechanical deformation effect on optical properties of biotissues by polarization-sensitive optical coherence tomography»

**2009-2010:** Grant of the Russian Foundation for Basic Research «Development of contrast enhancement techniques for tomographic images of strongly scattering objects in biomedical diagnostics»

### **Publications**

33 peer-reviewed journal publications, 3 book chapters, 120 publications and abstracts in conference proceedings

### **The most significant works and results**

#### Full list of peer-reviewed journal publications

1. П.Д. Агрба, Е.А. Бакшаева, Д.О. Эллинский, И.Л. Шливко, **М.Ю. Кириллин** “Роль механической компрессии при визуализации кожи человека методом кросс-поляризационной оптической когерентной томографии”, *Современные технологии в медицине*, 6(1) в печати (2014)
2. V. O. Korhonen, T. S. Myllylä, **M.Yu. Kirillin**, A. Popov, A. Bykov, A.V. Gorshkov, E.A. Sergeeva, M. Kinnunen, V. Kiviniemi, “Light propagation in near-infrared spectroscopy of the human brain”, *IEEE Journal of Selected Topics in Quantum Electronics*, in print (2013).
3. Губарькова Е.В., **Кириллин М.Ю.**, Сергеева Е.А., Киселева Е.Б., Снопина Л. Б., Проданец Н.Н., Шарабрин Е.Г., Шахов Е.Б., Немирова С.В., Гладкова Н.Д., “Кросс-поляризационная оптическая когерентная томография в оценке структуры атеросклеротической бляшки”, *Современные технологии в медицине*, 5(4), 24-34 (2013)

4. А.Д. Крайнов, А.М. Мокеева, Е.А. Сергеева, П.Д. Агрба, **М.Ю. Кириллин**, «Оптические свойства биотканей мышцы и их оптических фантомов» *Оптика и спектроскопия*, **115**(2), 47-54 (2013).
5. Пантелеева О.Г., Зиновьев А.Н., Юнусова К.Э., **Кириллин М.Ю.** и Шахова Н.М. «Диагностические возможности оптической интроскопии в выявлении причин нарушения репродуктивного здоровья женщин» отправлено в журнал *Российский вестник акушерства и гинекологии*
6. **M. Kirillin**, P. Agrba, and V. Kamensky “Mechanical compression in cross-polarization OCT imaging of skin: in vivo study and Monte Carlo simulation”, submitted to *Journal of Biomedical Optics*
7. A.V. Gorshkov, **M.Yu. Kirillin**, “Monte Carlo simulation of brain sensing by optical diffuse spectroscopy”, *Journal of Computational Science*, **3**, 498–503, (2012).
8. R. Su, **M. Kirillin**, P. Ekberg, A. Roos, E. Sergeeva, L. Mattsson “Optical coherence tomography for quality assessment of embedded microchannels in alumina ceramic”, *Optics Express*, **20**(4), 4603-4618 (2012).
9. **M. Kirillin**, O. Panteleeva, E. Yunusova, E. Donchenko, and N. Shakhova “Criteria for pathology recognition in OCT of fallopian tubes“, *Journal of Biomedical Optics*, **17**, 081413 (2012).
10. О.Г. Пантелеева, Б.Е. Шахов, К.Э. Юнусова, **М.Ю. Кириллин** и Н.М. Шахова «Оптическая интроскопия - новый метод диагностики в репродуктивной медицине», *Вестник радиологии и рентгенологии*, **4**, 50-55 (2012)
11. М.А. Sirotkina, М.В. Shirmanova, М.Л. Bugrova, V.V. Elagin, P.D. Agrba, **M.Yu. Kirillin**, V.A. Kamensky, E.V. Zagaynova, “Continuous optical coherence tomography monitoring of nanoparticles accumulation in biological tissues”, *Journal of Nanoparticle Research*, **13**(1), 283-291 (2011).
12. I.I. Fiks; **M. Yu Kirillin**; E.A. Sergeeva; I.V. Turchin, “Reconstruction of object location for diffuse fluorescence tomography on the basis of hybrid models of light scattering in biotissues” *Radiophysics and Quantum Electronics*, 54(3), 197-209 (2011).
13. E.A. Sergeeva, A.R. Katicheva, **M.Yu. Kirillin** “Two-photon fluorescence microscopy signal formation in highly scattering media: theoretical and numerical simulation”, *Quantum Electronics*, **40** (12), 1053–1061 (2010).
14. H.S.S. Sorvoja, T.S. Myllyla, **M.Yu. Kirillin**, E.A. Sergeeva, R.A. Myllyla, A.A. Elseoud, J. Nikkinen, O. Tervonen, V. Kiviniemi, “Non-invasive, MRI-compatible fiberoptic device for functional near-IR reflectometry of human brain”, *Quantum Electronics*, **40**(12), 1067- 1073 (2010).
15. **M. Kirillin**, I. Meglinski, V. Kuzmin, E. Sergeeva and R. Myllylä “Simulation of optical coherence tomography images by Monte Carlo modeling based on polarization vector approach”, *Optics Express*, **18**(21), 21714-21724 (2010).
16. **M.Yu. Kirillin**, P.D. Agrba and V.A. Kamensky “In vivo study of the effect of mechanical compression on formation of OCT images of human skin”, *Journal of Biophotonics*, **3**(12), 752-758 (2010).
17. **M.Yu. Kirillin**, P.D. Agrba, M.A. Sirotkina, M.V. Shirmanova, E.V. Zagaynova, and V.A. Kamensky “Nanoparticles as contrast-enhancing agents in optical coherence tomography imaging of structural components of skin: quantitative evaluation”, *Quantum Electronics*, **40**(6), 525-530 (2010).

18. P.D.Agrba, **M.Yu.Kirillin**, A.I. Abelevich, E.V.Zagaynova, V.A.Kamensky, "Compression as a method for increasing the informativity of optical coherence tomography of biotissues", *Optics and Spectroscopy*, **107**(6), pp. 853–858 (2009).
19. **M.Yu. Kirillin**, M.V. Shirmanova, M.A. Sirotkina, M.L. Bugrova, B.N. Khlebtsov and E.V. Zagaynova, "Contrasting properties of gold nanoshells and titanium dioxide nanoparticles for OCT imaging of skin: Monte Carlo simulations and in vivo study", *J.Biomed. Opt.*, **14**, 021017 (2009).
20. I. Meglinski, **M. Kirillin**, V. Kuzmin and R. Myllylä, "Simulation of Polarization-Sensitive Optical Coherence Tomography images by Monte Carlo method", *Optics Letters*, **33**(14), 1581-1583 (2008).
21. E.V. Zagaynova, M.V. Shirmanova, **M.Yu. Kirillin**, B.N. Khlebtsov, A.G. Orlova, I.V. Balalaeva, M.A. Sirotkina, M.L Bugrova, P.D. Agrba and V.A. Kamensky, "Contrasting properties of gold nanoparticles for optical coherence tomography: phantom, in vivo studies and Monte Carlo simulation", *Phys. Med. Biol.*, **53**, 4995-5009 (2008).
22. **M.Yu. Kirillin**, A.V. Bykov, A.V. Priezzhev, R. Myllylä, "Application of time gating in the measurement of glucose level in a three-layer biotissue model with ultrashort laser pulses" *Quantum Electronics*, **38**(5), 486-490 (2008).
23. **M.Yu. Kirillin**, A.V. Priezzhev, R. Myllylä, "Role of multiple scattering in formation of OCT skin images", *Quantum Electronics*, **38**(5), 486-490 (2008).
24. Е.В. Загайнова, М.В. Ширманова, В.А. Каменский, **М.Ю. Кириллин**, А.Г. Орлова, И.В. Балалаева, Б.Н. Хлебцов, А.М. Сергеев, "Исследование контрастирующих свойств золотых наночастиц для метода ОКТ", *Российские Нанотехнологии*, **2 (7-8)**, 135-143 (2007).
25. **M.Yu. Kirillin**, E. Alarousu, T. Fabritius, R. Myllylä and A.V. Priezzhev "Visualization of paper structure by optical coherence tomography: Monte Carlo simulations and experimental study", *Journal of the European Optical Society - Rapid Publications*, **2**, 07031 (2007).
26. A.V. Bykov, **M.Yu. Kirillin**, A.V. Priezzhev, R. Myllylä, "Simulations of a spatially resolved reflectometry signal from a highly scattering three-layer medium applied to the problem of glucose sensing in human skin", *Quantum Electronics*, **36** (12), 1125-1130 (2006).
27. E.A. Sergeeva, **M.Yu. Kirillin**, A.V. Priezzhev, "Propagation of a femtosecond pulse in a scattering medium: theoretical analysis and numerical simulation", *Quantum Electronics*, **36** (11), 1023-1031 (2006).
28. A.V. Bykov, **M.Yu. Kirillin**, and A.V. Priezzhev, "Monte Carlo Simulation of Signals from Model Biological Tissues Measured by an Optical Coherence Tomograph and an Optical Coherence Doppler Tomograph", *Optics and Spectroscopy*, **101** (1), 33–39 (2006).
29. **М.Ю. Кириллин**, А.В. Приезжев, М.С. Федосеева, «Анализ вкладов различных кратностей рассеяния в сигнал оптического когерентного томографа от слоя крови методом Монте-Карло», *Вестник МГУ.сер.3. Физика. Астрономия*, №2, 36-40 (2006).
30. **M.Yu. Kirillin**, I.V. Meglinskii, A.V. Priezzhev, "Effect of photons of different scattering orders on the formation of a signal in optical low-coherence tomography of highly scattering media", *Quantum Electronics*, **36** (3), 247-252 (2006).
31. **M.Yu. Kirillin**, A.V. Priezzhev, J. Hast, R. Myllylä "Monte Carlo simulation of optical clearing of paper in optical coherence tomography", *Quantum Electronics*, **36**(2), 174-180 (2006).

32. A.V. Bykov, **M.Yu. Kirillin**, A.V. Priezzhev, “Analysis of distortions in the velocity profiles of suspension flows inside a light-scattering medium upon their reconstruction from the optical coherence Doppler tomograph signal”, *Quantum Electronics*, **35**(11), 1079-1082 (2005).
33. **M.Yu. Kirillin**, A.V. Priezzhev, V.V. Tuchin, R.K. Wang and R. Myllylä “Effect of red blood cell aggregation and sedimentation on optical coherence tomography signals from blood samples”, *J. Phys. D: Appl. Phys.* **38**, pp. 2582-2589 (2005)
34. A.V. Bykov, **M.Yu. Kirillin** and A.V. Priezzhev, “Monte Carlo simulation of an optical coherence Doppler tomograph signal: effect of particle concentration on the reconstructed velocity profile”, *Quantum Electronics*, **35**, pp. 135-139 (2005)
35. **M.Yu. Kirillin** and A.V. Priezzhev, "Monte Carlo simulation of laser beam propagation in plain layer of red blood cell suspension. Comparison of contribution of different scattering orders to the angle distribution of light intensity", *Quantum Electronics*, **32**(10), pp. 883-887 (2002).

#### List of book chapters

1. A.V. Bykov, **M.Yu. Kirillin**, A.V. Priezzhev, “Monte Carlo simulation of light propagation in human tissues and noninvasive glucose sensing”, Chapter 3 in *Handbook of Optical Sensing of Glucose in Biological Fluids and Tissues* (Ed. – V.V. Tuchin), CRC Press, Boca Raton, London, New York, Washington, 2008, pp. 67-98.
2. V. Gelikonov, G. Gelikonov, **M. Kirillin**, N. Shakhova, A. Sergeev, N. Gladkova, E. Zagaynova “Fiber-Based OCT: From Optical Design to Clinical Applications”, Chapter 16 in *Handbook of Photonics for Biomedical Science* (Ed. – V.V. Tuchin), CRC Press, Boca Raton, London, New York, Washington, 2010, pp. 423-444.
3. **М.Ю. Кириллин**, И.И. Фикс, А.Р. Катичев, А.В. Горшков, В.П. Гергель, “Высокопроизводительные вычисления для задач оптической биомедицинской диагностики” в сборнике «Суперкомпьютерные технологии в науке, образовании и промышленности (третий выпуск)», ред. В.А. Садовничий, Г.И. Савин, Вл.В. Воеводин, М.: Издательство Московского университета, 2012. с. 222-229, ISBN 978-5-211-06345-7.

#### Editorials

1. **M. Kirillin**, K. König, N. Shakhova, B. Tromberg, A. Semyanov “Optical bioimaging and neuroimaging: from whole-body inspection to brain sensing”, *Journal of Biophotonics*, **3**(12), 741-742 (2010).
2. **M. Kirillin**, N. Shakhova, K. Sokolov and R. Steiner “Topical Problems of Biophotonics”, *Journal of Biophotonics*, **5**(11-12), 813-814 (2012).

#### Invited talks

1. **M.Yu. Kirillin**, E.A. Sergeeva, P.D. Agrba, E.B. Kiseleva, E.V. Gubarkova, D.O. Ellinsky, I.L. Shlivko, N.D. Gladkova, O.G. Panteleeva, and N.M. Shakhova, “Interpretation of OCT images in biotissue diagnostics: numerical simulation and analysis” (Invited) , “Topical Problems of Biophotonics 2013”, 21-27 July, Nizhny Novgorod-Myshkin-Kazan, Russia, (2013).
2. **M.Yu. Kirillin**, P.D. Agrba, E.A. Sergeeva, E.A. Bakshaeva, M.V. Shirmanova, M.A. Sirotkina, and V.A. Kamensky “Contrast enhancement in optical tomography of biotissues”,

“Topical Problems of Biophotonics 2011”, 16-22 July, St.Petersburg-Nizhny Novgorod, Russia (2011).

3. **M.Yu. Kirillin**, P.D. Agrba, and V.A. Kamensky “Methods of Contrasting in Optical Coherence Tomography of Biotissues”, ICONO/LAT, 23-27 August, Kazan, Russia, LTh11 (2010).
4. **M.Yu. Kirillin**, P. Agrba, M. Shirmanova, M. Sirotkina, V. Kamensky, “Image contrasting in optical tomography modalities”, Saratov Fall Meeting 2009 SFM 2009, Saratov, Russia, 21-24 September.
5. **M.Yu. Kirillin** and I.V. Meglinski, “Advanced Monte Carlo simulations of optical coherence tomography images”, Saratov Fall Meeting 2008 (SFM 2008), Saratov, Russia, 23-26 September.