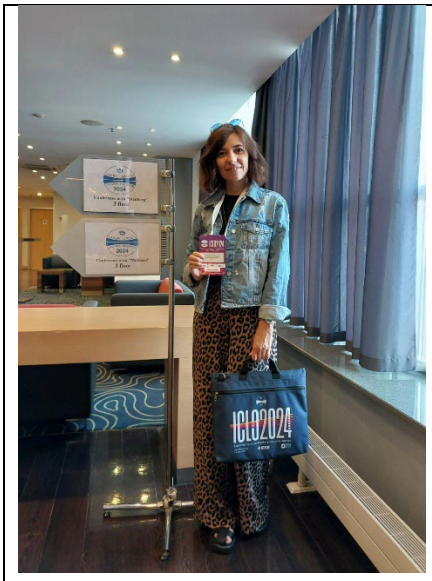
NATALIA Y. SHILYAGINA

University	National Research Lobachevsky State University of Nizhny Novgorod
Level of English proficiency	Upper-intermediate
Educational program and field of the educational program for which the applicant will be accepted	1.5. Biological Sciences 1.5.2. Biophysics
List of research projects of the potential supervisor (participation/leadership)	Research team leader: 1. RFBR Grant No. 20-34-70124 Stability "Analysis of the mechanisms of beta-radiation-induced secondary production of hydrogen peroxide in tumor cells and its role in the cell's response to radiation exposure" (2020-2021). 2. Scholarship of the President of the Russian Federation for young scientists and graduate students carrying out promising scientific research and development in priority areas of modernization of the Russian economy SP-1609.2021.4 "Screening studies of a series of new porphyrazine compounds with the properties of photosensitizers and local viscosity sensors for solving problems of personalized photodynamic therapy" (2021-2022). Core researcher: 1. RSF No. 18-15-00279 "Mechanisms of cell death in photodynamic therapy of neuro-oncological diseases", 2018-2020, (2021-2022). 2. RSF No. 18-15-00279 "Mechanisms of cell death in photodynamic therapy of neuro-oncological diseases", (2019-2020). Research team participant: 1. State assignment of the Ministry of Science and Higher Education of the Russian Federation No. 0729-2020-0061 (basic part) "Molecular basis of adaptation of living systems", (2020-2022). 2. State assignment of the Ministry of Science and Higher Education of the Russian Federation No. FSWR-2023-0032 "The influence of urban ecosystems on the adaptive potential of the human body", (2023-2025). 3. Peritoneal oncotheranostics: Unlocking unprecedented opportunities in nanomedicine" (strategic academic leadership program "Priority 2030"), (2022-2023). 4. Project of the Ministry of Science and Higher Education of the Russian Federation "Creation and development of a world-class scientific center "Photonics Center" (agreement No. 075-15-2020-927 dated November 13, 2020), (2020-2025).
List of the topics offered for the prospective scientific research	Study of the mechanisms of action of ionising radiation on tumour cells in different modes and exposure doses. Study of combined effects of different types of antitumour therapy. Analysis of the efficacy of photosensitizers of porphyrazine nature and the possibility of their application as agents for personalised photodynamic therapy. Investigation of nano- and submicron particles for selective delivery of antitumour drugs. Analysis of macrophage participation in selective delivery of anti-Stokes nanophosphors to peritoneal tumour foci using human ovarian cancer model as an example.
	Biophysics



Research supervisor:

Natalia Y. Shilyagina

associate professor

PhD (Candidate of Biological Sciences)

Supervisor's research interests

1. Research in the field of radiobiology: dose-effect relationship, cell death mechanisms, witness effect.
2. Photodynamic therapy research: antitumour activity, cellular uptake features, selectivity of accumulation in tumour models.
3. Research on nano- and submicron particles: targeted delivery systems, diagnosis and therapy of cancer.

Research highlights

The postgraduate student's work will be carried out (depending on the topic chosen) using the following techniques:

- cell culture cultivation,
- confocal fluorescence microscopy,
- flow cytometry,
- assessment of cell culture viability and cell death pathways,
- surface fluorescence imaging,
- radiometric analysis,
- spectrophoto- and fluorimetry.

Supervisor's specific requirements

Basic knowledge in the field of biophysics.
Ability to search for relevant scientific literature in English-language search databases of biomedical data with subsequent analysis of the material.
Proficient use of statistical data analysis software (GraphPad Prizm or other).
Experience in writing scientific articles and presenting papers at scientific conferences.
Good command of English.
Responsibility and diligence.

ORCID: 0000-0001-5766-6880
WoS (Hirsch index 16) 16 publications
Scopus (Hirsch index 16) 16 publications
RSCI (Hirsch index 15) 13 publications

1. Alzeibak R, Mishchenko TA, Shilyagina NY, Balalaeva IV, Vedunova MV, Krysko DV. Targeting immunogenic cancer cell death by photodynamic therapy: past, present and future. J Immunother Cancer. 2021 Jan;9(1):e001926. doi: 10.1136/jitc-2020-001926. Erratum in: J Immunother Cancer. 2021 Oct;9(10):e001926corr1. doi: 10.1136/jitc-2020-001926corr1
https://pubmed.ncbi.nlm.nih.gov/33431631/
IF 10.3 (WoS, Q1)

2. Balalaeva IV, Mishchenko TA, Turubanova VD, Peskova NN, Shilyagina NY, Plekhanov VI, Lermontova SA, Klapshina LG, Vedunova MV, Krysko DV. Cyanoarylporphyrazines with High Viscosity Sensitivity: A Step towards Dosimetry-Assisted Photodynamic Cancer Treatment. Molecules. 2021 Sep 25;26(19):5816. doi: 10.3390/molecules26195816
https://pubmed.ncbi.nlm.nih.gov/34641360/
IF 4.2 (WoS, Q1)

3. Krasnopeeva EL, Melenevskaya EY, Klapshina LG, Shilyagina NY, Balalaeva IV, Smirnov NN, Smirnov MA, Yakimansky AV. Poly(methacrylic Acid)-Cellulose Brushes as Anticancer Porphyrazine

	Carrier. Nanomaterials (Basel). 2021 Aug 3;11(8):1997. doi: 10.3390/nano11081997 https://pubmed.ncbi.nlm.nih.gov/34443825/ IF 4.4 (WoS, Q1) 4. Shestakova LN, Lyubova TS, Lermontova SA, Belotelov AO, Peskova NN, Klapshina LG, Balalaeva IV, Shilyagina NY. Comparative Analysis of Tetra(2-naphthyl)tetracyano-porphyrazine and Its Iron Complex as Photosensitizers for Anticancer Photodynamic Therapy. Pharmaceutics. 2022 Nov 30;14(12):2655. doi: 10.3390/pharmaceutics14122655 https://pubmed.ncbi.nlm.nih.gov/36559148/ IF 4.9 (WoS, Q1) 5. Lermontova SA, Arsenyev MV, Cherkasov AV, Fukin GK, Afanasyev AV, Yudintsev AV, Grigoryev IS, Ladilina EY, Lyubova TS, Shilyagina NY, Balalaeva IV, Klapshina LG, Piskunov AV. Novel Rigidochromic and Anti-Kasha Dual Emission Fluorophores Based on D-π-A Dyads as the Promising Materials for Potential Applications Ranging from Optoelectronics and Optical Sensing to Biophotonics and Medicine. Int J Mol Sci. 2023 Mar 18;24(6):5818. doi: 10.3390/ijms24065818 https://pubmed.ncbi.nlm.nih.gov/36982890/ IF 4.9 (WoS, Q1)
	Results of intellectual activity 1. Russian Federation utility model patent No. 150108. Priority from 29.09.2014. Device for the study of light activity of photosensitisers in vitro. 2. Russian Federation utility model patent No. 151289. Priority from 29.09.2014. Device of enhanced efficiency for the study of light activity of photosensitisers in vitro. 3. Russian Federation Patent No. 2611653 Priority from 23.12.2015. Composition for imaging and damaging target cells. 4. Russian Federation Patent No. 2621710 Priority from 23.08.2016. Porphyrazine, gadolinium porphyrazine complex and their applications. 5. Russian Federation Patent No. 2, 665,471 Priority from 07.12.2017. Cyanoporphyrazine free base and its applications. 6. Russian Federation Patent No. 2700421 Priority from 23.07.2018. Method of estimation of hydrogen peroxide content in tumour cells during photodynamic action. 7. Russian Federation Patent No. 2672806 Priority from 19.11.2018. Method of photodynamic therapy with real-time efficiency control.