

Curriculum Vitae

Svitlana Yu. Berezhna

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Work Address:

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Education:

Ph.D. Optics and Laser Physics, Physics Department I. Franko University, Lviv, Ukraine
1996

M.S. Physics (summa cum laude), Physics Department I. Franko University, Lviv, Ukraine
1988

Research Experience:

- 2002- present *Research Associate*, Nonlinear Optics Laboratory School of Optics/CREOL and Center for Discovery of Drug and Diagnostics/Molecular Biology, University of Central Florida
Visiting Alexander von Humboldt Research Scholar,
Max Plank Institute for Biophysical Chemistry, Gottingen, Germany
- 2001 – 2002 *Research Associate*, Laser Spectroscopy Center for Biomolecular Dynamics, Department of Physics, Northeastern University, Boston, MA
- 1998 – 2000 *JSPS Postdoctoral Fellow*, Department of Mechanical Engineering, Aoyama Gakuin University, Tokyo, Japan
- 1996 – 1998 *Research Scientist*, Institute for Physical Optics, I. Franko University, Lviv, Ukraine
- 1990 – 1993 *Research Scientist*, Institute for Applied Problems of Mechanics and Mathematics of Ukrainian National Academy of Sciences, Lviv, Ukraine

Research Interests:

Development of new optical technologies and instrumentations for biological microscopy and imaging and their applications for studies of biomolecular dynamics and interactions *in vitro* and *in vivo*:

- Assessing dynamics and interactions of mitochondrial proteins and membrane lipids (particularly cytochrome c and cardiolipin) during apoptosis
- Single molecule and single particle tracking fluorescence microscopy for assessing dynamics of single molecules in the cellular membranes (lipids and protein domains)
- Probing mechanism of lipoplex-mediated transfection at single molecule level
- Intracellular micromechanics, mechanotransduction and cell mechanical response via optical particle tracking

Skills:

- In-depth knowledge of general and non-linear optics
- Linear and nonlinear (fluorescence correlation, fluorescence two-photon excitation, CARS) optical microscopy and imaging, optical spectroscopy (fluorescence, vibrational, ultrafast, femtosecond coherent)
- Optics for studies of mechanical stresses and strains
- High precision full-field polarimetry, digital image processing
- Hands-on skill with cw and pulsed lasers
- Hands-on skills with biological samples preparation and handling (mitochondria, proteins, DNA, cell cultures, artificial membrane systems such as giant unilamellar vesicles, quantum dots)

Professional Membership:

Optical Society of America
Biophysical Society

Professional Awards:

1996 *OAD Research Scholarship for Junior Scientists from Austrian Ministry of Education*
Institute for Mechanics, Technical University of Vienna, Vienna, Austria
Numerical ray tracing in the region of crack tip in elastic medium

1998-2000 *Research Postdoctoral Fellowship from Japan Society for Promotion of Science*
Aoyama Gakuin University, Tokyo, Japan
Development of imaging Fourier polarimetry for stress tensor field optical tomography

1999-2001 *National Research Council Twinning Program Grant*
Department of Mechanical Engineering and Mechanics, Lehigh University, PA, USA
Development of optical method for 2-D stresses measurement feasible for industrial applications

2002-2004 *Research Fellowship from Alexander von Humboldt Foundation, Germany*
Max Plank Institute for Biophysical Chemistry, Gottingen, Germany
Development of single particle tracking methodology to study dynamics of mitochondria proteins and membrane lipids *in vivo*

Other Professional Activity and Services:

Participated in writing and submitting several research grant proposals to the NSF and NIH as Co-PI
(currently in a pending status)

Reviewer for OSA journals

Professional References:

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List of Publications:

Journal publications

1. Berezhna, S.Yu., Bogdanova, A.V., Pashkovsky, M.V. Spectroscopic Studies and Urbakh's Rule in Cs_2HgBr_4 Crystal. *Physics of Solid States*, V.30, No2, 690-693, 1988.
2. Berezhna S.Yu., Berezhnyy I.V. Reconstruction of the Jones Matrix of an object using a PCSA polarimeter. *Optics and Spectroscopy*. V.70, No 5, 649-651, 1991.
3. Berezhna S.Yu., Berezhnyy I.V. Reconstruction of the Jones Matrix of an Object Using a PCSA Polarimeter. 2: Inverse Problem. *Optics and Spectroscopy*. V.70, No 6, 779-781, 1991.

4. Berezna S.Yu., Berezhnyy I.V. Determining the Refractive Index Matrix by an Optical Polarization Method . Optics and Spectroscopy. V.72, No 3350-352, 1992.
5. Berezna S.Yu. Tensor Optical Equations of Integrated Photoelasticity Theory. Optics and Spectroscopy. V.73, No 1, 82-83, 1992.
6. Berezna S.Yu., Berezhnyy I.V., Vlokh O.G. Optical Tomography of Weakly Anisotropic Inhomogeneous Objects. Optics and Spectroscopy. V.75, No 5,626-628, 1993.
7. Berezna S.Yu., Berezhnyy I.V., Vlokh O.G. The Use of the HIPO-Method in Optical Tomography of Anisotropic Media. Optics and Spectroscopy.1996, V.81, No 5, 776-778.
8. Berezna S.Yu., Berezhnyy I.V. Information Content of the Polarization Optical Measurement Method for Media with a Complex Dielectric Constant Tensor. Optics and Spectroscopy. V.83, No5, 718-720, 1997
9. Berezna S.Yu., Berezhnyy I.V., Takashi M. Photoelastic Analysis through Jones Matrix Imaging Fourier polarimetry, JSME International Journal of Solid Mechanics and Material Engineering. Vol.43, No4, 321-326, 2000
10. Berezna S.Yu., Berezhnyy I.V., Takashi M. Dynamic photometric imaging polarizer-sample-analyzer polarimeter: instrument for mapping birefringence and optical rotation. Journal of the Optical Society of America, A, Vol.18, No 3, 666-672, 2001
11. Berezna S.Yu., Berezhnyy I.V., Takashi M. Integrated photoelasticity through imaging Fourier polarimetry of an elliptic retarder. Applied Optics, Vol. 40, No4, 644-651, 2001
12. Berezna S.Yu., Berezhnyy I.V., Takashi M., Voloshin A.S. Full-field automated photoelasticity by Fourier polarimetry using three-wavelengths. Applied Optics, Vol.40, No 1, 52-61, 2001
13. Berezna S.Yu, Berezhnyy I.V., Takashi, M. High-resolution birefringence imaging in three-dimensional stressed models by Fourier polarimetry. Applied Optics, Vol.40, No28, 4940-4946, 2001
14. Berezna S.Yu., Berezhnyy I.V., Takashi M., Voloshin A.S. Multicolor Fourier polarimetry for imaging stress-induced birefringence: achievements and perspectives (review). Journal of Optics Research, Vol. 9, No 2, 47-84, 2001
15. Berezna S.Yu., Wohlrab, H., Champion P., Resonance Raman investigations of cytochrome c conformational changes upon interaction with the membranes of intact and Ca^{2+} -exposed mitochondria, Biochemistry, Vol.42, No20, 6149-6158, 2003.
16. Gordon, S.P., Scherfeld D., Kahya, N., Berezna, S., Schwille, P. Lipoplex-mediated Transfection: New Insights into the Mechanism of DNA Delivery Using Model Cellular Membranes, Journal of Biological Chemistry, in press
17. Berezna, S., Schaefer, S., Gordon, S.P., Scherfeld D., Schwille, P. The Role of Charge Driven Interactions in Lipofection with Cationic Liposome-DNA Complexes, Biophys.J., in preparation

Conference publications

1. Berezna, S.Yu., Batenchuk, M.M., Gamernyk, R.V., Birefringent and Spectral Properties of Cs_2HgBr_4 Crystals, // in "Optics of Anisotropic Medium", Proceedings of the Institute of Crystallography of National Academy of Sciences of USSR, Moscow, 1988, 51-54.
2. Berezna S.Yu., Berezhnyy I.V., Krupych O.M., Vlokh O.G. A Method for Nondestructive Testing of Glass Insulators with Welding Inclusions // in "Technology and quality of glass", Proceedings of the International Conference on Glass and Glass Structures, 1993, November 21-25, Konstantinonka, Ukraine. - 1993, 49-51.
3. Berezna S.Yu., Berezhnyy I.V., Vlokh O.G. Optical Tomography of Anisotropic Inhomogeneous Media // in Recent Advances in Experimental Mechanics, Proceedings of

- the 10th International Conference on Experimental Mechanics, Lisbon, Portugal, 18-22 July, 1994, eds. J.F. Silva Gomes, et al., A.A. Balkema/Rotterdam/ Brookfield/ 1994, Vol 1, 431-435.
4. Berezhna S.Yu., Berezhnyy I.V., Krupych O.M., Vlokh O.G. Some Peculiarities of Dielectric Tensor Field's Optical Tomographical Technique // Proceedings of SPIE, 1995, V.2648, 622-626.
 5. Berezhna S.Yu., Berezhnyy I.V., Krupych O.M., Vlokh O.G. To the Problem of Simulation in Optical Computer Tomography //in Proceedings of the 5th International Conference on Education, Practice and Promotion of Computing Methods in Engineering Using Small Computers , Macao, Portugal, 15-19 August 1995, eds. J.F. Silva Gomes, et. al, A.A. Balkema/Rotterdam/ Brookfield/ 1996, Vol.2, 1571-1576.
 6. Berezhna S.Yu., Berezhnyy I.V., Krupych O.M., Vlokh O.C. Polarimetry Technique in Optical Computerized Tomography // in Advanced Technology in Experimental Mechanics, Proceedings of International Symposium, Tokyo, Japan, 21-24 October , eds. M.Takashi, et.al., Japan Society of Mechanical Engineering, Tokyo, 1995, 89-94.
 7. Berezhna S.Yu., Berezhnyy I.V., Vlokh O.G., Krupych O.M. Determination of the Optical Anisotropy Parameters in Transparent Composite Systems // in Proceedings of International Conference on Progress in Durability Analysis of Composite Systems, Brussels, Belgium, 17- 21 July 1995, eds. A.Cardon, et.al., A.A. Balkema/Rotterdam/ Brookfield/ 1996, 301-305.
 8. Berezhna S.Yu., Berezhnyy I.V., Krupych O.M., Vlokh O.G. On the Application of Polarimetry Technique in Optical Computerized Tomography of Anisotropic Media // in Proceedings of SPIE, 1996, No 3094, 169-174.
 9. Berezhna S.Yu., Berezhnyy I.V. Polarization Optical Tomographical Technique as a Component Part of a Hybrid Method for Elastic Analysis // in Proceedings of 2nd International Workshop on Advances in Experimental Mechanics, Portorose, Slovenia, 7-12 September 1997, eds. I.Emri and R. Cvelbar, Centre for Experimental Mechanics, University of Ljubljana, 1997, 103-108.
 10. Berezhna S.Yu., Berezhnyy I.V., Takashi M., Krupych O.M. Jones Matrix Imaging Polarimeter as an Experimental Tool for a Stress Field Optical Tomography // in Proceedings of 3rd International Workshop on Advances in Experimental Mechanics, Piran, Slovenia, 16-22 August 1998, eds. I.Emri and R.Cvelbar, Centre for Experimental Mechanics, University of Ljubljana, 1998, 117-124.
 11. Berezhna S.Yu., Berezhnyy I.V., Takashi M. Optical Tomographical Technique as a Part of a Hybrid Method for Elastic Analysis //in Proceedings of 11th International Conference on Experimental Mechanics, Oxford, UK, 24-28 August 1998, eds.P.Stanley, et.al., A.A. Balkema/Rotterdam/ Brookfield/ 1998, Vol.1, 489-494.
 12. Berezhna S.Yu., Berezhnyy I.V., Otsuka T., Takashi M. Jones Matrix Imaging Fourier Polarimeter: Applications in Photoelasticity // in Proceedings of 1999 SEM Spring Conference on Experimental Mechanics, Cincinnati, OH, 6-9 June, 1999, SEM, Bethel, CT, 1999, 612-615.
 13. Berezhna S.Yu., Berezhnyy I.V., Takashi M. Stress Tensor Field Tomography through Polarimetry: Accuracy of Optical Data // in Proceedings of 4th International Workshop on Advances in Experimental Mechanics, Bled, Slovenia, 15-21 August 1999, eds. I.Emri and R.Cvelbar, Centre for Experimental Mechanics, University of Ljubljana, 1999, 117-126.
 14. Berezhna S.Yu., Berezhnyy I.V., Takashi M. Photoelastic Analysis through Jones Matrix Imaging Fourier Polarimetry // in Proceedings of International Conference on Advanced Technologies in Experimental Mechanics, 17-22 July Ube, Japan, eds. K.Hatanaka, et.al., Japan Society of Mechanical Engineering, Tokyo, No 99-204, Vol.2, 1999, 635-640.

15. Berezna S.Yu., Berezhnyy I.V., Takashi M., Voloshin A. S. Accuracy of whole-field mapping by Jones matrix Fourier photopolarimeter // in Optoelectronic and Hybrid Optical/Digital Systems for Image and Signal Processing, SPIE Proceedings Vol.4148, 2000, 81-89.
16. Krupytch O.M., Berezna S.Yu., Berezhnyy I.V., Takashi M. Whole-field Mapping in Polarization's Studies by Use of Null Polarimetry // in Optoelectronic and Hybrid Optical/Digital Systems for Image and Signal Processing, SPIE Proceedings Vol.4148, 2000, 216-222.
17. Berezna S.Yu., Berezhnyy I.V., Takashi M. Measurement of Three Parameters for Integrated Photoelasticity by Use of Imaging PSA Fourier Polarimeter // in Proceedings of 2000 SEM IX International Congress and Exposition on Experimental Mechanics, 5-8 June 2000, Orlando, Florida, SEM, Bethel, CT, 2000, 856-859.
18. Berezna S.Yu., Berezhnyy I.V., Takashi M. Three-dimensional Photoelasticity through Fourier polarimetry // in Proceedings of 5th International Workshop on Advances in Experimental Mechanics, 13-18 August 2000, Bled, Slovenia, eds. I.Emri and R.Cvelbar, Centre for Experimental Mechanics, University of Ljubljana, 2000,73-94.
19. Voloshin A., Berezna S.Yu., Berezhnyy I.V., Takashi M., Phase Unwrapping through Spectral Contents Approach // in Proceedings of 2001 SEM Spring Conference on Experimental Mechanics, Portland, Oregon, 2001, SEM, Bethel, CT, 2001, 371-375.
20. Ye X., Demidov A., Berezna S.Yu., Champion, P., Photodissociation Quantum Yields of MbNO and MbO₂ // in Abstracts of Annual APS March Meeting 2002, March 18-22, 2002, T30- 009.
21. Berezna, S.Yu., Champion P., Conformations of Cytochrome C in Intact and Damaged Mitochondria Studied by Resonant Raman Spectroscopy // in OSA "Topics in Biomedical Optics", OSA Technical Digest of Biomedical Optics Topical Meeting, April 7-10, 2002 , Miami Beach, OSA, Washington, DC, 2002, PD13-1- PD13-3.
22. Berezna, S.Yu., Wohlrab, H., Champion, P. Studies of Cytochrome c Interaction with the Mitochondria Membrane by Resonance Raman Spectroscopy // Biophys.J (Annual Meeting Abstracts) 2003, 22 Plat
23. Berezna, S., Heintzmann, R., Kahya, N., Schaefer, S., Gordon, S., Schwille, P. Imaging and tracking of single molecules in giant unilamellar vesicles // in "Focus on Microscopy 2003" , Genoa, Italy, April13-16, 5, 2003
24. Berezna. S., Schwille, P. Single Particle Tracking for Probing Cellular Viscoelasticity // in Proceedings of 8th International Workshop on Advances in Experimental Mechanics, Portorose, Slovenia, 10-16 August 2003, eds. I.Emri and R. Cvelbar, Centre for Experimental Mechanics, University of Ljubljana, 2003.
25. Berezna, S., Gordon, S., Schwille, P. Probing lipofection at single molecule level using giant unilamellar vesicles.// International Symposium on Elucidating Biomolecular Networks by Single Molecule Technologies, Monte Verita, Ascona, Switzerland, 26-31 October, 2003, eds H.Vogel, Swiss Inst.Technol., 59, 2003

Patents (fSU)

1. Berezna S.Yu., Berezhnyy I.V. A Method for the Determination of Optical Polarization Properties in Non-depolarized Media // Patent of USSR No 1702767, 7 .04. 1991.