Osman Akcakir

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Goal:

- To develop and apply novel optical techniques to extract new information about biological structures and processes.

Personal Information:

- ***Citizenship:*** Canadian ***Birthplace:*** Timmins, Canada ***Marital Status:*** Married

Education:

- B.Sc., University of Toronto, Honours degrees in Physics and in Neuroscience, 05/1993.
- M.Sc., University of Waterloo, Physics, Thesis: "Isotropic-Nematic Interface of Liquid Crystalline Polymers" (Advisor: Prof. Z.Y. Chen), 8/1995.
- Ph.D., University of Illinois at Urbana-Champaign, Physics, Laboratory for Fluorescence Dynamics, Thesis: "Silicon Nanoparticle Characterization by Fluorescence Correlation Spectroscopy" (Advisor: Prof. E. Gratton), 12/2001.

Experience:

- **Postdoctoral Research Fellow,** Biophysics Research Division, University of Michigan, 01/2002-present.
  Built a single molecule microscope with time-resolved confocal and wide-field CCD imaging capabilities.
  Expressed, labelled and purified the protein domain src SH3 for single molecule studies of protein folding.
  Measured single-molecule traces of immobilized proteins undergoing folding-unfolding transitions.
- **Graduate Research Assistant**, Laboratory for Fluorescence Dynamics, Department of Physics, University of Illinois at Urbana-Champaign, 09/1996-12/2001.
  Developed a method to measure the molecular heterogeneity of colloids/solutions by performing scanning excitation FCS and successfully applied it to the characterization of the heterogeneity of ~1nm sized silicon nanocrystal colloids. Acquired experience in the following areas:
  - two-photon and one-photon (UV) Fluorescence Correlation Spectroscopy (FCS), as well as Photon Counting Histogram (PCH) analysis of fluorescence fluctuation experiments,
  - two-photon laser-scanning microscopy for fluorescence intensity and lifetime imaging (frequency domain heterodyning method),
  - ultra-fast mode-locked lasers (Ti:Sapphire).

- **Graduate Teaching Assistant**, Department of Physics, University of Illinois at Urbana-Champaign, 1995-96. Held introductory discussion/demonstration sessions oriented towards non-physics majors and maintained course material on web.
- **Graduate Research and Teaching Assistant,** Department of Physics, University of Waterloo, 1993-1995. Numerically solved the problem of the orientational order across an isotropic-nematic liquid crystalline polymer interface using the density functional approach.
  Held tutorials in introductory physics, electricity and magnetism, and graded a graduate level statistical mechanics course.

Publications:

- *Si-N linkage in ultrabright, ultrasmall Si nanoparticles*, E. Rogozhina, G. Belomoin, A. Smith, L. Abuhassan, N. Barry, O. Akcakir, P.V. Braun, M. Nayfeh, App. Phys. Lett. 78 (23): 3711-3713 (2001).
- *Stimulated blue emission in reconstituted films of ultrasmall silicon nanoparticles*, M. Nayfeh, N. Barry, J. Therrien, O. Akcakir, E. Gratton, G. Belomoin, Appl. Phys. Lett. 78 (8): 1131-1133 (2001).
- *Second harmonic generation in microcrystallite films of ultrasmall Si nanoparticles,* M. Nayfeh, O. Akcakir, G. Belomoin, N. Barry, E. Gratton, Appl. Phys. Lett. 77 (25): 4086-4088 (2000).
- *Detection of luminescent single ultrasmall silicon nanoparticles using fluctuation correlation spectroscopy,* O. Akcakir, J. Therrien, G. Belomoin, N. Barry, J.D. Muller, E. Gratton, M. Nayfeh, Appl. Phys. Lett. 76 (14): 1857-1859 (2000).
- *Highly nonlinear photoluminescence threshold in porous silicon*, M. Nayfeh, O. Akcakir, J. Therrien, Z. Yamani, N. Barry, W. Yu, E. Gratton, Appl. Phys. Lett. 75 (26), 4112 – 4114 (1999).
- *Isotropic-nematic interface of liquid-crystalline polymers*, S.-M. Cui, O. Akcakir, and Z.Y. Chen, Phys. Rev. E 51, 4548-4557 (1995).

Conference Presentations:

- *"Detection of Luminescent Single Ultra-small Silicon Nanoparticles using Fluctuation Correlation Spectroscopy"*, O. Akcakir, J.Therrien, G. Belomoin, N.P. Barry, J. Muller, E. Gratton, M. Nayfeh, APS (American Physical Society) March Meeting 2000, Minneapolis, MN (talk).
- *"Characterisation of Fluorescent Silicon Nanoparticles under Two-Photon Excitation"*, O. Akcakir, N.P. Barry, E. Gratton, J. Therrien, G.A. Belomoin, J. Muller, M.H. Nayfeh, 2000 Biophysical Society Conference, New Orleans, LA (poster presentation).
- *"Sapphire-anvil-cell for High-Pressure Fluctuation Correlation Spectroscopy"*, O. Akcakir and E. Gratton, 1999 Biophysical Society Conference, Baltimore, MD (poster presentation).
- *"High Pressure Stage for Fluctuation Correlation Spectroscopy Microscopy"*, O. Akcakir and E. Gratton, 1998 Biophysical Society Conference, Kansas City, MO (poster presentation).

- *"Single Protein Molecule Reaction by Two-Photon Excited Fluorescence"*, O. Akcakir and E. Gratton, 1997 Biophysical Society Conference, New Orleans LA (poster presentation).

Awards & Scholarships:

- **Scarborough College Physics Prize**, Scarborough College, University of Toronto, 1990.
- **NSERC Summer Research Scholarship**, (Prof. P. Sinervo, Dept. of Physics, University of Toronto) 1991.

Patents:

- Silicon Nanoparticle Microcrystal Nonlinear Optical Devices, (United States Patent 6,456,423, with N. Barry, G. Belomoin and M.H. Nayfeh).
- Silicon Nanoparticle Stimulated Emission Devices (United States Patent 6,597,496, with N. Barry and M.H. Nayfeh).

Affiliations:

- APS (American Physical Society)
- Biophysical Society

References:

- Prof. E. Gratton,
  Laboratory for Fluorescence Dynamics
  Department of Physics
  University of Illinois
  1110 W. Green St.
  Urbana, Illinois 61801
  Tel: (217) 244-5620 email: lfd@uiuc.edu

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  Department of Physics
  Randall Laboratory
  University of Michigan
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  Ann Arbor, Michigan 48109-1120
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- Prof. A. Gafni,
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