



Adam P Wax



Professor of Biomedical Engineering

Dr. Wax's research interests include optical spectroscopy for early cancer detection, novel microscopy and interferometry techniques.

The study of intact, living cells with optical spectroscopy offers the opportunity to observe cellular structure, organization and dynamics in a way that is not possible with traditional methods. We have developed a set of novel spectroscopic techniques for measuring spatial, temporal and refractive structure on sub-hertz and sub-wavelength scales based on using low-coherence interferometry (LCI) to detect scattered light. We have applied these techniques in different types of cell biology experiments. In one experiment, LCI measurements of the angular pattern of backscattered light are used to determine non-invasively the structure of sub-cellular organelles in cell monolayers, and the components of epithelial tissue from freshly excised rat esophagus. This work has potential as a diagnostic method for early cancer detection. In another experiment, LCI phase measurements are used to examine volume changes of epithelial cells in a monolayer in response to environmental osmolarity changes. Although cell volume changes have been measured previously, this work demonstrates for the first time the volume of just a few cells (2 or 3) tracked continuously and in situ.

APPOINTMENTS AND AFFILIATIONS

- Professor of Biomedical Engineering
- Faculty Network Member of the Duke Institute for Brain Sciences
- Member of the Duke Cancer Institute

CONTACT INFORMATION

- **Office Location:** 2571 CIEMAS, Durham, NC 27708
- **Office Phone:** (919) 660-5143
- **Email Address:** a.wax@duke.edu
- **Websites:**

- Ph.D. Duke University, 1999
- M.A. Duke University, 1996
- B.S. Rensselaer Polytechnic Institute, 1993

RESEARCH INTERESTS

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SPECIALTIES

Photonics

Medical Imaging

Cancer diagnostics and therapy

Sensing and Sensor Systems

AWARDS, HONORS, AND DISTINCTIONS

- Fellow. International Society for Optics and Photonics. 2010
- Fellows. Optical Society of America. 2010

COURSES TAUGHT

- BME 494: Projects in Biomedical Engineering (GE)
- BME 550: Modern Microscopy (GE, IM)
- BME 590: Special Topics in Biomedical Engineering
- BME 701S: BME Graduate Seminars
- BME 702S: BME Graduate Seminars
- BME 728S: Teaching Seminar for New Teaching Assistants
- BME 729S: Teaching seminar for repeat teaching assistants
- BME 789: Internship in Biomedical Engineering
- BME 791: Graduate Independent Study
- BME 899: Special Readings in Biomedical Engineering
- MENG 550: Master of Engineering Internship/Project
- MENG 551: Master of Engineering Internship/Project Assessment
- PHYSICS 493: Research Independent Study

IN THE NEWS

- [A Better Way to Measure the Stiffness of Cancer Cells \(http://pratt.duke.edu/about/news/cell-stiffness\)](http://pratt.duke.edu/about/news/cell-stiffness) (MAR 2, 2017 | *Pratt School of Engineering*)
- [Holographic Imaging and Deep Learning Diagnose Malaria \(http://pratt.duke.edu/about/news/spotting-malaria\)](http://pratt.duke.edu/about/news/spotting-malaria) (SEP 16, 2016)

Optogradients, Journal of Optics A: Pure and Applied Optics, vol 19 no. 9 (2017), pp. 093003-093003 [10.1088/2040-8986/aa783b (<http://dx.doi.org/10.1088/2040-8986/aa783b>)] [abs (<https://scholars.duke.edu/individual/pub1273811>)].

- Zhao, Y; Eldridge, WJ; Maher, JR; Kim, S; Crose, M; Ibrahim, M; Levinson, H; Wax, A, *Dual-axis optical coherence tomography for deep tissue imaging.*, Optics Letters, vol 42 no. 12 (2017), pp. 2302-2305 [10.1364/ol.42.002302 (<http://dx.doi.org/10.1364/ol.42.002302>)] [abs (<https://scholars.duke.edu/individual/pub1262207>)].
- Chowdhury, S; Eldridge, WJ; Wax, A; Izatt, J, *Refractive index tomography with structured illumination*, Optica, vol 4 no. 5 (2017), pp. 537-537 [10.1364/OPTICA.4.000537 (<http://dx.doi.org/10.1364/OPTICA.4.000537>)] [abs (<https://scholars.duke.edu/individual/pub1259543>)].
- Chowdhury, S; Eldridge, WJ; Wax, A; Izatt, JA, *Structured illumination multimodal 3D-resolved quantitative phase and fluorescence sub-diffraction microscopy.*, Biomedical Optics Express, vol 8 no. 5 (2017), pp. 2496-2518 [10.1364/boe.8.002496 (<http://dx.doi.org/10.1364/boe.8.002496>)] [abs (<https://scholars.duke.edu/individual/pub1252801>)].
- Steelman, ZA; Eldridge, WJ; Weintraub, JB; Wax, A, *Is the nuclear refractive index lower than cytoplasm? Validation of phase measurements and implications for light scattering technologies.*, Journal of biophotonics (2017) [10.1002/jbio.201600314 (<http://dx.doi.org/10.1002/jbio.201600314>)] [abs (<https://scholars.duke.edu/individual/pub1250759>)].

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Citation overview

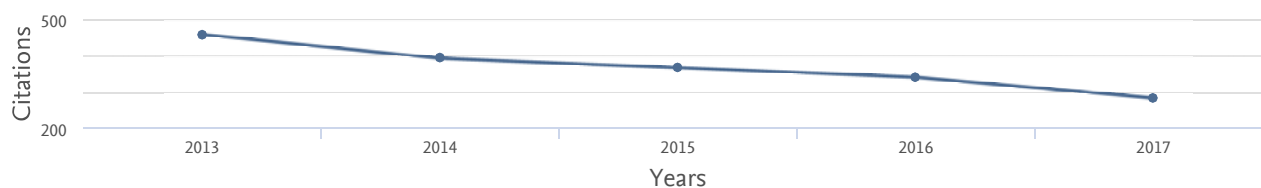
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