

Eric E Monson

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Employment

Research Scientist (9/07 – *present*), Duke Visualization & Interactive Systems · Computer Science · Media Arts + Sciences

Scientific and information visualization research, consulting, teaching and software development. Creation of novel 2D and 3D web and desktop visualizations, interfaces and analysis methods for complex data sets. Integration of technology and quantitative methods into humanistic scholarship, including data gathering, cleaning, modeling and visualization.

Research Scientist (9/06 – 8/07) · **Research Associate** (9/02 – 8/06), Duke University Physics with Anna L Lin.

Experimental and numerical studies of the signaling between neurons and glial cells using fluorescence imaging and nonlinear spatio-temporal pattern analysis.

Education

Postdoctoral Researcher, University of Michigan Chemistry (9/99 – 8/02) with Raoul Kopelman.

Managed a large *National Cancer Institute, Unconventional Innovations Program* contract for early cancer detection and therapy using targeted, nanoparticle-based MRI contrast and photodynamic therapy agents.

Ph.D. in Applied Physics, University of Michigan, Ann Arbor (February 1999).

Thesis title: Nano-scale spatial and temporal fluorescence fluctuations in near-field microscopy, photobleaching recovery, and non-classical elementary reaction kinetics.

Thesis advisor: Raoul Kopelman, Kasimir Fajans Collegiate Professor of Chemistry, Physics and Applied Physics.

S.B. in Physics, Massachusetts Institute of Technology (June 1990).

Research Interests & Skills

Research Interests – Current: Scientific and information visualization, data and visual literacy, dimensionality reduction and dictionary learning techniques, relational data modeling, graphic design, image processing, natural language processing – **Past:** Live-cell fluorescence microscopy, intracellular ion sensors, lasers and optical instrumentation, numerical simulations of neuron, reaction-diffusion and immune systems

Languages & Software – Proficient: Python, Matlab, C++, JavaScript, D3.js, OpenRefine, RegEx, Tableau, Excel, Gephi, Palladio, MongoDB, SQL, HDF5, Elasticsearch, VTK/ParaView, MALLET, NLTK, Adobe Illustrator/Photoshop/InDesign, HTML/CSS, Markdown, Git – **Functional:** Bash, Avizo, SketchUp, Filemaker Pro, Apache Solr – **Familiar:** PHP, C#/WPF

Teaching & Mentorship

DUKE UNIVERSITY

Directed the Visualization & Interactive Systems group (summer 2012 – *present*). This involved direct supervision of the technology and art consultant Sarah Goetz, organization of materials for public events and demonstrations, and running weekly group meetings with researchers from MA+S, Engineering, and Data and Visualization Services.

Advised and mentored Ronak Etemadpour, a visiting graduate student from Jacobs University (Bremen, Germany), during her year of research at Duke (2012 calendar year). Also served on her thesis committee (2013).

Taught and developed curriculum and examinations for an innovative, semester-long coding technology independent study, through which Katie Jentleson became the first Duke Art History graduate student to have computer programming (Python, SQL and Regular Expressions) accepted as one of her foreign language equivalency exams (fall 2012).

Administered a year-long independent study to Katherine de Vos Devine during which we developed databases and prototype web-based visualization platforms for exploring language usage in intellectual property case law (2011 – 2012).

Consulted with many Historical Art Markets undergraduate and graduate students on data gathering, cleaning, modeling

(relational database construction) and visualization. Also developed tutorial materials for and presented in-class on these topics (2011 – present).

Developed and conducted training sessions for scientists and engineers (undergraduates, grad students and faculty) in many aspects of visualization and visual literacy; including workshops on poster design, illustration techniques, and network visualization software; and preparation of diagrams, charts and graphs (2008 – present).

UNIVERSITY OF MICHIGAN

Taught introductory chemistry lab sections (fall 1995 – winter 1997).

Received Milton Tamres Outstanding Teaching Award (1997).

Received Rackham Graduate School Outstanding Graduate Student Instructor Award (1997).

Participated in and helped organize Summer Science for Girls (2 years, Physics department).

Conducted oral and video in-class teaching feedback sessions through the Center for Research on Learning and Teaching.

Service

Served on the MA+S Steering Committee (2008 – present), and the Visual Studies Executive Committee (2012 – 2013).

Co-organized and ran a weekly talk series, the Visualization Friday Forum (fall 2012 – present). It averages 50 attendees per week and brings together researchers and students from many departments across campus and other local universities.

Organized and ran the weekly Media Arts + Sciences Rendezvous talk series where faculty and student have a chance to share their recent work to both educate and get feedback from the community (fall 2011 – present).

Presentations (selected from more than 49 since 2000)

RESEARCH RESULTS & METHODS

“Putting a Spit Shine on the Getty Provenance Index”, *Media Arts + Sciences Rendezvous* (May 2015)

“Low-Dimensional Representations for Learning Fast Molecular Dynamics Simulations and New Visualizations”, *Visualization Friday Forum* (w/Miles Crosskey, Feb 2014)

“Staying Broad and Shallow: Learning on the Fly” [*] *Doing Digital Humanities, Duke FHI* (Dec 2013)

“Enabling Art History Visualization” [*] *Center for Molecular and Biomolecular Imaging Symposium* (Dec 2012)

“Visualizing Text: Tools & Techniques” [*] *Text > Data Speaker Series, Duke Library* (Nov 2012)

“Data Visualization: Some Whys and Hows” [*] *Digital Research 1.0 Talk Series, Duke Library* (Mar 2012)

“Markov Modeling of Rat Hippocampal Cell Dynamics” [†] *Nonlinear Sciences Gordon Conference* (Jun 2007)

“Spatio-Temporal Dynamics of Traumatized Neuron/Glial Cell Subnetworks” [†] *Nonlinear Sciences Gordon Research Conference* (Jun 2005)

WORKSHOPS & TUTORIALS

“Practical Data Visualization” [*‡] *Duke University Marine Lab* (Jun 2014 & 2015)

“Designing Academic Figures” [*‡] *Duke iiD, Data+* (Jun 2015)

“Visual Communication for Scientific Research” [*‡] *Medical Physics Graduate Student Symposium* (Mar 2014)

“Using Gephi for Network Analysis and Visualization” [‡] *Duke Data and Visualization Services* (Feb 2014, Sept 2014)

“Scientific Posters” [*‡] *Duke Chemistry* (Jun 2013)

“Figures, Tables and Captions for Print” [*] *Medical Physics Graduate Student Symposium* (Feb 2010 & 2012)

“Scientific Graphics with Adobe Illustrator: Don’t be scared – really, it’s fun!” [*] *Duke Social Sciences Research Institute* (Nov 2008)

[* invited, † peer reviewed, ‡ in collaboration with Duke Data and Visualization Services]

Selected Publications

JOURNAL ARTICLES

R Etemadpour, E Monson, L Linsen (2013) “The Effect of Stereoscopic Immersive Environments on Projection-Based Multi-dimensional Data Visualization”, *Information Visualization*, 389–397

- AJ Catllá, DG Schaeffer, TP Witelski, EE Monson & AL Lin (2008) “On Spiking Models for Synaptic Activity and Impulsive Differential Equations”, *SIAM Review* 50, 553–569.
- AC Horton, B Rácz, EE Monson, AL Lin, RJ Weinberg & MD Ehlers (8 Dec 2005) “Polarized Secretory Trafficking Directs Cargo for Asymmetric Dendrite Growth and Morphogenesis”, *Neuron* 48, 757–771.
- E Monson & R Kopelman (2004) “Non-Classical Kinetics of an Elementary $A+B\rightarrow C$ Reaction-Diffusion System Showing Effects of a Speckled Initial Reactant Distribution and Self-Segregation: Experiments”, *Phys. Rev. E* 69 (2), 021103.
- H Xu, F Yan, EE Monson, & R Kopelman (2003) “Room-temperature preparation and characterization of poly (ethylene glycol)-coated silica nanoparticles for biomedical applications”, *J. Biomed. Mater. Res. Part A* 66A, 870–879.
- NK Kerner, B Black, E Monson & L Meeuwenberg (2002) “Training Instructors to Facilitate Collaborative Inquiry”, *J. Student Centered Learning* 1, 29–36.
- E Monson & R Kopelman (2000). “Observation of laser speckle effects and nonclassical kinetics in an elementary chemical reaction”, *Phys. Rev. Lett.* 85, 666–669.
- HA Clark, SLR Barker, M Brasuel, MT Miller, E Monson, S Parus, ZY Shi, A Song, B Thorsrud, A Kopelman, A Ade, W Meixner, B Athey, M Hoyer, D Hill, R Lightle & MA Philbert (1998) “Subcellular optochemical nanobiosensors: probes encapsulated by biologically localised embedding (PEBBLES)”, *Sens. Actuator B-Chem.* 51, 12–16.
- AL Lin, E Monson & R Kopelman (1997) “Nonclassical dimension-dependent kinetics of a photobleaching reaction in a focused laser beam ‘phototrap’”, *Phys. Rev. E* 56, 1561–1566.
- E Monson, G Merritt, S Smith, JP Langmore & R Kopelman (1995) “Implementation of an NSOM System for Fluorescence Microscopy”, *Ultramicroscopy* 57, 257–262.

BOOK CHAPTERS

- E Monson (2012) “Delving into Image Features”, in FC Frankel & AH DePace, *Visual Strategies (ch. Interactive Graphics)*. Yale University Press, New Haven & London, 124–127.
- E Monson, M Brasuel, MA Philbert & R Kopelman (2003) “PEBBLE Nanosensors for *in vitro* Bioanalysis”, in T Vo-Dinh (ed.) *Biomedical Photonics Handbook*. CRC Press, Boca Raton, FL, 59.1–59.14.
- M Brasuel, R Kopelman, MA Philbert, JW Aylott, HA Clark, I Kasman, M King, E Monson, JP Sumner, H Xu, M Hoover, TJ Miller & R Tjalkens (2002) “PEBBLE Nanosensors for Real Time Intracellular Chemical Imaging”, in F Ligler, C Rowe-Tait (eds.) *Optical Biosensors: Present and Future*. Elsevier, Amsterdam, 407–536.

CONFERENCE PROCEEDINGS

- EE Monson, G Chen, R Brady & M Maggioni (2010) “Data representation and exploration with Geometric Wavelets”, IEEE Symposium on Visual Analytics Science and Technology (VAST), 243-244.
- H Xu, F Yan, E Monson, W Tang, R Kopelman, RJ Schneider & MA Philbert (2002) “Preparation and Characterization of Poly(ethylene-glycol)-Coated Stöber Silica Nanoparticles for Biomedical Applications”, *SPIE (Int. Soc. Opt. Eng.)*, 383–393.
- E Monson & R Kopelman (2001) “Observation of Laser Speckle Effects in an Elementary Chemical Reaction”, in JM Drake, J Klafter, PE Levitz, M Urbach (eds.) *Materials Research Society Symposium*, Boston, MA, T7.27.21–T27.27.26.
- E Monson, AL Lin & R Kopelman (1996) “The anomalous diffusion-limited reaction kinetics of a phototrapping reaction”, *Materials Research Society Symposium*, Boston, MA.

PATENTS

- J Anker, E Monson, R Kopelman & MA Philbert (2003) “Modulated Chemical Sensors”, *Patent Application No. 10/419,033*, Regents of the University of Michigan, USA.
- R Kopelman, HA Clark, E Monson, S Parus, MA Philbert & B Thorsrud (2002) “Optical fiberless sensors”, *US Patent No. 6,379,955*, Regents of the University of Michigan, USA.
- R Kopelman, HA Clark, E Monson, S Parus, MA Philbert. & B Thorsrud (2000) “Optical fiberless sensors for analyzing cellular analytes”, *US Patent No. 6,143,558*, Regents of the University of Michigan, USA.