Anthony Tanbakuchi

Curriculum Vitae

✉ *anthony@tanbakuchi.com*
www.tanbakuchi.com

Optical Engineering | Lens Design | Teaching | Technical Writing | Public Speaking

Education

2009   **PhD, Optical Sciences**, *University of Arizona, College of Optical Sciences*, 3.90 GPA, *Tucson, AZ*.
Advisor: Dr. Arthur Gmitro
Dissertation: *A surgical confocal microlaparoscope for real-time optical biopsies*
Minor: Biomedical Engineering

2005   **MS, Optical Sciences**, *University of Arizona, College of Optical Sciences*, 3.94 GPA, *Tucson, AZ*.

2003   **Advanced Graduate Certificate, Applied Statistical Quality**, *Rochester Institute of Technology, College of Engineering, Center for Quality and Applied Statistics*, 3.83 GPA, *Rochester, NY*.
Completed graduate certificate in parallel with undergraduate studies.

2003
Magna
Cum Laude   **BS, Imaging and Photographic Technology**, *Rochester Institute of Technology, College of Imaging Arts and Sciences*, 3.90 GPA, *Rochester, NY*.
Communications Minor
Outstanding Undergraduate Scholar: limited to no more than top 1% of graduating class.

2001   **AS, Information Technology**, *Rochester Institute of Technology*, College of Computing and Information Sciences, *Rochester, NY*.

Patents

7,477,781   **Method and apparatus for adaptive pixel correction of multi-color matrix.** Inventor: Anthony Tanbakuchi (sole), Assignee: DALSA Corporation, Waterloo, CA, 2009

Knowledge and Skills

Communication   **Abilities:** Teaching (mathematics, optics, programming), public speaking, technical writing, technical presentations, technical illustrations

Optics   **Knowledge:** Lens design, optical system design, aberrations, radiometry, thin films, diffraction, interferometry, optical shop testing, optical alignment, lasers

Design Software: Zemax, Code V

Statistics   **Knowledge:** Design of experiments, statistical process control, hypothesis testing, Monte Carlo modeling, parameter estimation, data modeling

Analysis Software: R, S, Minitab

Programming & Software	**General:** C, Objective-C, Cocoa, Python, Shell
	Mathematics: Mathematica, Matlab, Maxima
	Mechanical Design: Solid Works, AutoCad
	Operating Systems: Mac OS X, Microsoft, Linux
	Office Automation: LaTeX, MS Office
Other	**General:** Basic machine shop practices

Experience

Research & Development Positions

2009 – Current **Senior Member of the Technical Staff**, *Optical Payload Design and Realization Department, Sandia National Laboratories*, Albuquerque, New Mexico.
I design and develop optical imaging and non-imaging systems for space, air, and land.

2004 – 2009 **Research Associate**, *Department of Radiology, College of Medicine, University of Arizona*, Tucson, Arizona.
My dissertation research focused on developing a fiber-coupled multi-spectral confocal microendoscope for live optical biopsies during surgery. This instrument was the first confocal laparoscope used in-vivo in humans. My work involved:
– Design of a confocal laparoscope with computerized z-scan and contrast agent delivery.
– Design of a second generation flexible confocal endoscope.
– Development of the mobile surgical system, real-time software, and control systems.
– Miniaturization of the optical scanning unit.
– Testing the safety and efficacy in human clinical trials for early detection of cancer.
– Development of a second generation miniature multi-conjugate broadband objective.
– Monte Carlo analysis of an asymmetrical confocal aperture system.
– Monte Carlo analysis of non-uniformly distributed fluorescence under confocal imaging.
– Development of sub millimeter confocal imaging catheters with contoured tips.

2002 – 2003 **Biomedical Imaging Consultant**, *Center for Visual Science, University of Rochester Medical Center*, Tucson, Arizona.
My research involved developing an automated microscopy system for scanning rat ganglion cells for vision research.

2001 – 2002 **Sensor Engineer**, *Philips Research Laboratories, Image Sensors Division, Royal Philips Electronics*, Eindhoven, The Netherlands.
My research focused on:
– Development of algorithms for correcting defects in large area CCD detectors.
– Developing improved color filter array interpolation methods.

Teaching Positions

2006 – 2009   **Adjunct Faculty**, *Department of Mathematics & Department of Technology, Pima Community College*, Tucson, Arizona.

- Received positive dean's teaching evaluation.
- Consistently received positive student evaluations.
- Certified to teach college transferrable mathematics and optical science courses.

Spring 2002   **Instructor**, *Imaging and Photographic Technology Department, Rochester Institute of Technology*, Rochester, New York.
I was the first undergraduate student in our college's history to independently teach a course.

1999 – 2001   **Teaching Assistant**, *Imaging and Photographic Technology Department, Rochester Institute of Technology*, Rochester, New York.

Professional Positions

Summer 2003   **Applications Engineer**, *Eastman Kodak Company Research Labs*, Rochester, New York.
My position involved helping customers choose the appropriate image sensor for their application as well as answering customer engineering questions.

Summer 2000   **Park Ranger**, *U.S. National Park Service, Department of the Interior*, Mount Rushmore National Monument, South Dakota.

- The position involved researching and developing original educational programs about the park's natural, historical, and cultural resources.
- I presented multiple programs on a daily basis to groups up to 250 people.
- On a weekly basis I presented evening programs to audiences up to 2,500 people.

Summer 1999   **Park Ranger**, *U.S. National Park Service, Department of the Interior*, Timpanogos Cave National Monument, Utah.

- The position involved researching and developing original educational programs about the park's natural, historical, and cultural resources.
- I presented multiple programs on a daily basis to groups up to 30 people.
- Recipient of a service award recognizing exemplary work.

Courses Taught

Mathematics

Introductory Statistics   **Pima Community College**, 6 semesters.
A course in applied statistics. Includes sampling, data display, measures of central tendency, variability, and position; random variables, probability, probability distributions; sampling distributions, assessing normality, confidence intervals, hypothesis testing, ANOVA, and regression. Use of the statistics software R is taught throughout the course.

- In addition to teaching the concepts, mathematics, and applications of statistics, I also taught students how to use the research-grade statistics language R (www.r-project.org).
- Extensive course material development including online surveys filled out in class and automatically updated in lecture examples to improve student participation, relevance, and interest.

Trigonometry	**Pima Community College**, 2 semesters.
	A course on trigonometric functions, identities, graphs, and proofs; vectors, polar coordinates, complex numbers, and conic sections.

Optics and Imaging

Optics Technology	**Pima Community College**, 1 semester.
	An introduction to optics and optical systems. An integrated lab and lecture course that covers the basic principles of electromagnetic radiation, optical materials, ray tracing and basic imaging systems and components. Content includes: mirrors, lenses, Fresnel lenses, dispersion, diffraction gratings, polarization mechanisms, lasers, holograms, optical fibers, telescope designs, and projectors.
Systems Design for Graphic Presentation	**Rochester Institute of Technology**, 1 semester.
	A lab and lecture course covering the hardware, software, and concepts necessary to understand how digital images are captured, stored, and processed in modern imaging systems. Image processing using Matlab is taught during the lab component of the course.

Honors

June 2008	**Apple WWDC08 Student Scholarship, $1,300.** Award to attend the 2008 developer conference.
Nov 2007	**BIO5 Innovator Award (Dissertation Research).** Award for graduate translational research. The BIO5 Innovator Award recognizes one graduate student and one undergraduate student annually at the University of Arizona whose research has the potential to support the mission of BIO5 Institute for Collaborative BioResearch in multidisciplinary bioscience research, innovation in education, or entrepreneurship.
Nov 2007	**First Place for Graduate Research in Engineering (Dissertation Research).** University of Arizona Student Showcase. An annual university wide graduate research competition.
2006 – 2007	**Imaging Fellowship, $10,386.** This fellowship program is for graduate students who are pursuing a doctoral degree focused on the science, technology, or applications of imaging.
June 2007	**Apple WWDC07 Student Scholarship, $1,300.** Award to attend the 2007 developer conference.
2003 – 2006	**BMIS Fellowship, $65,316.** Ruth L. Kirschstein National Research Service Award in Biomedical Imaging & Spectroscopy. The BMIS program is an NIH funded graduate fellowship program. The fellowships are designed to support the training of the next generation of interdisciplinary scientists who can create, adapt, develop, and apply imaging and spectroscopy systems, tools, and methods, to important biomedical problems.
May 2003	**Graduation Speaker, College Delegate.** College of Imaging Arts and Sciences, Rochester Institute of Technology. Each college selects one student representative to be part of the Commencement delegation. Student delegates are selected for personal achievement demonstrating the ideals of RIT, including, but not limited to, academic achievement.

May 2003	**Outstanding Undergraduate Scholar.** Rochester Institute of Technology. The award is limited to at most 1% of RIT students. The award recognizes excellence in academic achievement and the recipients are designated RIT Scholars. Students are nominated by their college and then evaluated by a committee composed of their college's dean and five faculty members. The committee is free to call upon other persons from the faculty, staff or student body for help in reaching a decision.
May 2003	**Phi Kappa Phi Honor Society.**
1998 – 2003	**Presidential Scholarship, $20,000.** Rochester Institute of Technology. Presidential Scholarships are awarded to a select number of entering freshman students each year based on a comprehensive review of the student's academic record, recommendations, and the RIT academic program requirements. Recipients demonstrate outstanding academic performance, leadership, and extra curricular activities related to their major.
Spring 2002	**First Place, Public Speaking Contest.** Fourteenth annual university wide contest, Rochester Institute of Technology.
1999 – 2000	**Dr. Ronald Francis Scholarship, $5,000.** The scholarship is awarded to students who, through their accomplishments to date, have demonstrated a potential for noteworthy contributions to the imaging profession and have demonstrated a serious commitment to their academic studies.
Summer 1999	**Service Award, U.S. National Parks Service.**
Spring 1999	**PIEA Second Place.** Photo Imaging Education Association Student-Teacher Photo Competition, single image category.
Spring 1998	**Level I Award: National Foundation for Advancement in the Arts, $3,000.** NFAA awardee in photography. The national program evaluates students against a standard of excellence for their discipline and age. Of the 6-8,000 annual applicants, up to 150 students are chosen to participate in youngARTS Week, during which they are brought to Miami for an all-expenses-paid week of master classes, showcase performances, exhibitions, interdisciplinary activities, enrichment programs, interviews, and the final auditions.
Spring 1998	**Ford Scholarship, $1,000.** Selection based on academic merit.

Publications

Journal Papers

Anthony A Tanbakuchi, Joshua A Udovich, Andrew R Rouse, Kenneth D Hatch, and Arthur F Gmitro. In vivo imaging of ovarian tissue using a novel confocal microlaparoscope. *Am J Obstet Gynecol*, Oct 2009.

Anthony A Tanbakuchi, Andrew R Rouse, Joshua A Udovich, Kenneth D Hatch, and Arthur F Gmitro. Clinical confocal microlaparoscope for real-time in vivo optical biopsies. *J Biomed Opt*, 14(4):044030, 2009.

Anthony A Tanbakuchi, Andrew R Rouse, and Arthur F Gmitro. Monte carlo characterization of parallelized fluorescence confocal systems imaging in turbid media. *J Biomed Opt*, 14(4):044024, 2009.

Houssine Makhlouf, Arthur F Gmitro, Anthony A Tanbakuchi, Josh A Udovich, and Andrew R

Rouse. Multispectral confocal microendoscope for in vivo and in situ imaging. *J Biomed Opt*, 13(4):044016, 2008.

Joshua Anthony Udovich, Nathaniel D Kirkpatrick, Angelique Kano, Anthony Tanbakuchi, Urs Utzinger, and Arthur F Gmitro. Spectral background and transmission characteristics of fiber optic imaging bundles. *Appl Opt*, 47(25):4560–8, Sep 2008.

Peer Reviewed Conference Proceedings

Anthony A. Tanbakuchi, Andrew R. Rouse, Kenneth D. Hatch, and Arthur F. Gmitro. Clinical results with acridine orange using a novel confocal laparoscope. volume 7172, page 717217. SPIE, 2009.

Anthony A. Tanbakuchi, Andrew R. Rouse, Kenneth D. Hatch, Richard E. Sampliner, Josh A. Udovich, and Arthur F. Gmitro. Clinical evaluation of a confocal microendoscope system for imaging the ovary. volume 6851, page 685103. SPIE, 2008.

Joshua A. Udovich, Andrew R. Rouse, Anthony Tanbakuchi, Molly A. Brewer, Richard Sampliner, and Arthur F. Gmitro. Confocal micro-endoscope for use in a clinical setting. volume 6432, page 64320H. SPIE, 2007.

Houssine Makhlouf, Anthony A. Tanbakuchi, Andrew R. Rouse, and Arthur F. Gmitro. Design of a multi-spectral channel for in-vivo confocal microscopy. volume 6432, page 643206. SPIE, 2007.

Andrew R. Rouse, Anthony A. Tanbakuchi, Joshua A. Udovich, and Arthur F. Gmitro. Design of an in vivo multi-spectral confocal microendoscope for clinical trials. volume 6082, page 608205. SPIE, 2006.

Anthony A. Tanbakuchi, Andrew R. Rouse, Josh A. Udovich, and Arthur F. Gmitro. Surgical imaging catheter for confocal microendoscopy with advanced contrast delivery and focus systems. volume 6082, page 608202. SPIE, 2006.

Josh Udovich, Nethanial Kirkpatrick, Anthony Tanbakuchi, and Arthur Gmitro. Fluorescence spectral characteristics of fiber optic imaging bundles. Number FTuG2, Washington, DC, 2005. Optical Society of America.

William Des Jardin, Steve Kosman, Neal Kurfiss, James Johnson, David Losee, Gloria G. Putnam, and Anthony Tanbakuchi. Two-phase full-frame ccd with double ITO gate structure for increased sensitivity. volume 5301, pages 59–66. SPIE, 2004.

Anthony A. Tanbakuchi, Arjen van der Sijde, Bart Dillen, Albert J. P. Theuwissen, and Wim de Haan. Adaptive pixel defect correction. volume 5017, pages 360–370. SPIE, 2003.

Talks

Anthony Tanbakuchi. A surgical confocal microlaparoscope for real-time optical biopsies. Industrial Affiliates Workshop, College of Optical Sciences, University of Arizona, February 2009.

Anthony Tanbakuchi. Clinical evaluation of a confocal microendoscope system for imaging the ovary. SPIE Photonics West Conference, San Jose, CA, Jan 2008.

Anthony Tanbakuchi. The confocal microendoscope for in-vivo cellular imaging. Industrial Affiliates Workshop, Department of Radiology, University of Arizona, Dec 2007.

Anthony Tanbakuchi. In-vivo cellular diagnostics. Radiology Research Lectures Series, Department of Radiology (invited talk), Oct 2006.

Anthony Tanbakuchi. A confocal surgical imaging catheter. Imaging Fellowship, University of Arizona, Oct 2006.

Anthony Tanbakuchi. The confocal microendoscope. Biomedical Imaging and Spectroscopy Fellowship, University of Arizona, Feb 2006.

Anthony Tanbakuchi. Surgical imaging catheter for confocal microendoscopy with advanced contrast delivery and focus systems. SPIE Photonics West Conference, San Jose, CA, Jan 2006.

Anthony Tanbakuchi. Adaptive pixel defect correction. SPIE Electronic Imaging Conference, San Jose, CA, Jan 2003.

Conference Abstracts & Posters

Arthur F. Gmitro, Anthony A. Tanbakuchi, Houssine Makhlouf, and Andrew R. Rouse. A novel multi-point scan architecture for a high frame rate multi-spectral confocal microendoscope. In *Novel Techniques in Microscopy*. Optical Society of America, 2009.

Anthony Tanbakuchi, Andrew Rouse, Houssine Makhlouf, Josh Udovich, Kenneth Hatch, and Arthur Gmitro. Multi-spectral confocal imaging system for optical biopsy in surgery. University of Arizona Phoenix Showcase, Pheonix, AZ, Feb 2008.

Anthony Tanbakuchi, Andrew Rouse, Houssine Makhlouf, Josh Udovich, Kenneth Hatch, and Arthur Gmitro. A real-time confocal microendoscope for in-vivo optical biopsies: data processing pipeline. Scientific Poster Session, Apple World Wide Developers Conference, San Francisco, CA, Jun 2008.

Anthony Tanbakuchi, Andrew Rouse, Houssine Makhlouf, Josh Udovich, Kenneth Hatch, and Arthur Gmitro. The multi-spectral confocal imaging system for optical biopsy in surgery. Scientific Poster Session, Apple World Wide Developers Conference, San Francisco, CA, Jun 2007.

Anthony Tanbakuchi, Andrew Rouse, Houssine Makhlouf, Josh Udovich, Kenneth Hatch, and Arthur Gmitro. The multi-spectral confocal imaging system for optical biopsy in surgery. Arizona Health Sciences Center Frontiers in Biomedical Research Poster Forum, Tucson, AZ, Oct 2007.

Anthony Tanbakuchi, Andrew Rouse, Houssine Makhlouf, Josh Udovich, Kenneth Hatch, and Arthur Gmitro. The multi-spectral confocal imaging system for optical biopsy in surgery. University of Arizona Graduate Student Showcase, Tucson, AZ, Nov 2007.

Anthony Tanbakuchi, Andrew Rouse, Houssine Makhlouf, Josh Udovich, Kenneth Hatch, and Arthur Gmitro. The multi-spectral confocal imaging system for optical biopsy in surgery. ARIBI Bio-Imaging Workshop, Tucson, AZ, Dec 2007.

Andrew Rouse, Anthony Tanbakuchi, Josh Udovich, Diljith Thodi, Houssine Makhlouf, and Arthur Gmitro. The multi-spectral confocal microendoscope for optical biopsy. Sixth Biannual Arizona Biosciences Symposium, Phoenix, AZ, 2006.

Anthony Tanbakuchi, Andrew Rouse, Josh Udovich, Diljith Thodi, Houssine Makhlouf, and Arthur Gmitro. The multi-spectral confocal microendoscope for optical biopsy. NIBIB Training Grantees Workshop, Washington DC, 2006.

Josh Udovich, Anthony Tanbakuchi, and Arthur Gmitro. Mobile confocal micro-endoscope for in-vivo clinical imaging. BIO5 MRB Dedication, Tucson, AZ, 2006.

Houssine Makhlouf, Anthony Tanbakuchi, Andrew Rouse, and Arthur Gmitro. In-vivo multi-spectral confocal microendoscope. BIO5 MRB Dedication, Tucson, AZ, 2006.

Arthur F. Gmitro, Andrew R. Rouse, Anthony A. Tanbakuchi, and Joshua A. Udovich. Confocal microendoscopy: An emerging tool for in situ disease diagnosis. In *Biomedical Optics*, page WB3. Optical Society of America, 2006.

Anthony Tanbakuchi, Andrew Rouse, Josh Udovich, Diljith Thodi, Houssine Makhlouf, and Arthur Gmitro. The multi-spectral confocal micro-endoscope: real-time in-vivo cellular imaging. NIBIB Training Grantees Workshop, Baltimore, MD, Jun 2006.

Anthony Tanbakuchi, Saurabh Srivastava, Andrew Rouse, and Arthur Gmitro. Real time display and automated image classification for confocal microendoscopy. Advances in optics for biotechnology, medicine and surgery, Copper Mountain, Colorado, Jul 2005.

Josh Udovich, Nethanial Kirkpatrick, Anthony Tanbakuchi, Urs Utzinger, and Arthur Gmitro. High resolution autofluorescence measurements of fiber optic imaging bundles. Advances in optics for biotechnology, medicine and surgery, Copper Mountain, Colorado, Jul 2005.

Arthur Gmitro, Andrew Rouse, Anthony Tanbakuchi, and Josh Udovich. The confocal microendoscope: A tool for cancer diagnosis and image-guided therapy. Thirteenth SPORE Investigators' Workshop, Washington D.C., 2005.

Anthony Tanbakuchi, Arjen van der Sijde, Bart Dillen, Albert Theuwissen, and Wim de Haan. Adaptive pixel defect correction. University of Arizona Annual Photonics and Imaging Initiative Workshop, Tucson, AZ, Jan 2004.

Professional Affiliations

SPIE	**Member.** Society of Photo Optical Engineers
OSA	**Member.** Optical Society of America
APS	**Member.** American Physical Society

Service

May 2006	Presented invited talk entitled "Art and Science" at the Canyon Crest High School, Envision Guest Speaker Series, San Dieguito Union High School District, Del Mar, California.
June 2005	Presented workshop entitled "Medical Optics", Optics Summer Camp, Youth University, The University of Arizona.

Updated

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